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ROYAL COMM. ON FOREST RESERVATION & NATL. PARK REPORT

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PAPERS AND REPORTS

UPON

FORESTRY, FOREST SCHOOLS,

FOREST ADMINISTRATION AND MANAGEMENT

IN

EUROPE, AMERICA, AND THE BRITISH POSSESSIONS,

AND UPON

FORESTS AS PUBLIC PARKS AND SANITARY RESORTS.

COLLECTED BY

MR. A. HERKWOOD,

(Chief Officer of the Lands Branch of the Department of Crown Lands) under the direction of the Commissioner of Crown Lands.

TO ACCOMPANY THE REPORT OF THE ROYAL COMMISSION ON FOREST RESERVATION AND NATIONAL PARK.

PRINTED BY ORDER OF THE LEGISLATIVE ASSEMBLY.

TORONTO:
PRINTED BY WARWICK & SONS, 68 & 70 FRONT STREET WEST
1893.

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INTRODUCTION.

"A great State was a desert, and the land
Lay bare and lifeless under sun and storm,
Treeless and shelterless. Spring came and went,
And came, but brought no joy; but, in its stead,
The desolation of the ravening floods,
That leaped like wolves or wild cats from the hills,
And spread destruction over fruitful farms;
Devouring as they went the works of man,
And sweeping seaward Nature's kindly soils,
To make the water-courses worse than waste.

"The forest trees, that in the olden time—
The people's glory, and the poet's pride—
Tempered the air and guarded well the earth,
And, under spreading boughs, for ages kept
Great reservoirs to hold the snow and rain,
From which the moisture thro' the teeming year,
Flowed equably but freely—all were gone.
Their precious bole exchanged for paltry cash,
The cash that melted and had left no sign;
The logger and the lumberman were dead;
The axe had rusted out for lack of use;
But all the endless evil they had done
Was manifested in the desert waste.

"Dead springs no longer sparkled in the sun;
Lost and forgotten brooks no longer laughed,
Deserted mills mourned all their moveless wheels
The snow no longer covered, as with wool,
Mountain and plain, but buried starving flocks
In Arctic drifts; in rivers and canals
The vessels rotted idly in the mud,
Until the spring flood buried all their bones;
Great cities that had thriven marv'lously,
Before their source of thrift was swept away,
Faded and perished, as a plant will die
With water banished from its roots and leaves;
And men sat starving in their treeless waste,
Beside their treeless farms and empty marts,
And wondered at the ways of Providence!"

THE UTILITY OF FORESTS

Forests as Objects of Industry

one year to ninety-nine years old and this is called the normal growing stock. Without the presence on the forest of this series of age gradations it would be impossible to obtain a regular annual yield of trees one hundred years old

The subjoined table gives the capital invested in a forest worked upon the principle of a sustained annual yield. The data for the growing stock are taken from the Yield Tables for the Scotch Pine by M. Weise converted into English measures. In calculating the value of the growing stock it has been assumed that lagnes would not yield any money return and that timber including all pieces of three inches diameter and upwards at the thin end would yield two pence per cubic foot under a rotation of thirty years, gradually rising to five pence per cubic foot under a rotation of one hundred and twenty years. Soil adapted for the growth of Scotch pines is generally light and the value of such land of the I or best quality cannot on an average, be estimated at more than £25 per acre, while land of the II or middling quality may be estimated at £ 2 per acre, and land of the V or lowest quality at £1, though land of the latter quality is not worth more than a few shillings per acre

CAPITAL INVESTED IN FORESTRY—POUNDS STERLING PER ACRE.

Length of rotation in years.	I Quality best.			III. Quality middling.			V Quality lowest.		
	Land.	Growing stock	Total	Land.	Growing stock	Total.	Land.	Growing stock	Total.
	£	£	£	£	£	£	£	£	£
30.	25	8	33	13	3	16	1	1	2
40.	25	17	42	13	7	19	1	3	4
50.	25	29	54	13	13	26	1	5	6
60.	25	35	60	13	17	30	1	8	12
70.	25	45	70	13	23	36	1	9	10
80.	25	55	80	13	28	41	1	16	18
90	25	69	94	13	35	47	1	26	34
100.	25	80	105	13	41	54			
110	25	93	118	13	65	69			
120.	25	146	171	13	68	70			

1. This table shows that the capital increases with the length of the rotation

2. That the value of the growing stock is at first smaller than the value of the land, equal to it under a rotation of from forty to fifty years, and greater after that period

(3. That the capital invested in timber forests is considerably greater than that of the land only

Recommendations on Marketing

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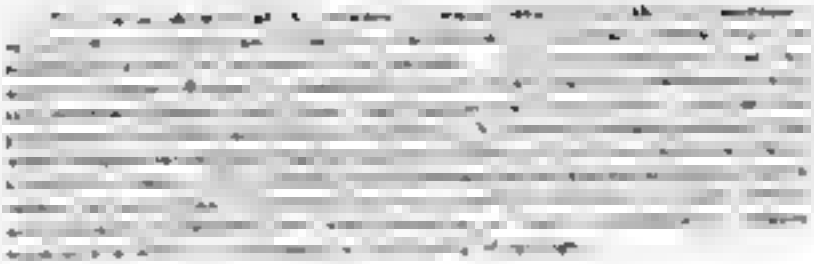
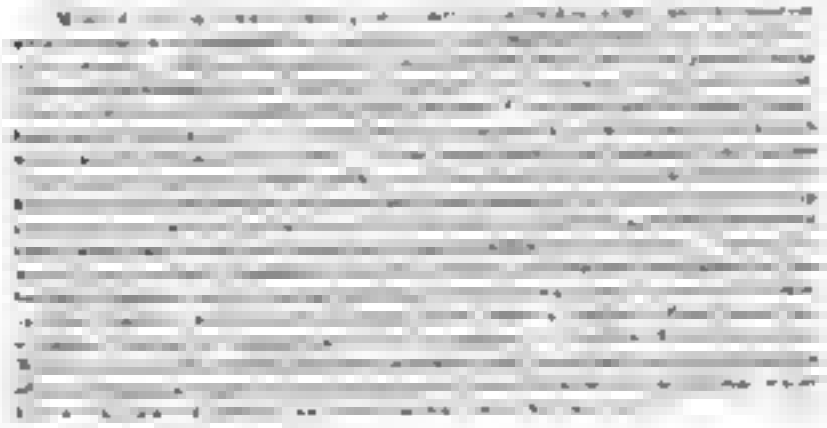


(c) *Welding of sprays and rivets*



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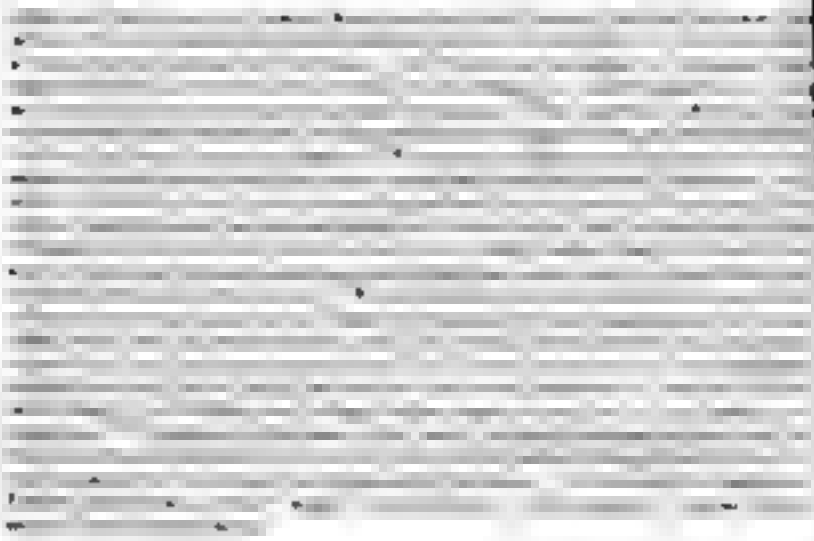

must be determined on the special circumstances of each country. By way of illustration the areas at present under forest in a number of countries are shown in the following table:

Countries.	Area under forest, in acres.	Percentage of total area of country under forest.	Forest area per head of population in acres.	Distribution of forest area, according to ownership, in percentage of total forest area.		
				State and crown forests.	Forests of communes, municipalities, etc.	Private forests.
Servia	5,166,000	43	3.5			
Russia in Europe	651,425,000	43	5	10	40	
Sweden	42,597,000	43	9.1	20	80	
Austria proper	24,161,000	33	3.1	6	94	
Hungary	33,036,000	30	1.4	16	52	32
Germany	34,320,000	26	.8	33	19	48
Norway	18,930,000	20	9.6	13	1	86
Turkey, including Bulgaria, Bosnia and Herzegovina	30,512,000	22	3.0			
Roumania	4,942,000	20	2			
Italy	14,826,000	20	6	6	41	53
Switzerland	4,992,000	19	7	4	67	29
Spain	21,345,000	17	1.3	82		18
France	20,700,000	16	6	7	23	65
Greece	3,838,000	16	.2	90		10
Belgium	1,073,000	15	.2			
Holland	384,000	7				
Denmark	417,000	6	3			
Portugal	1,188,000	5	2			
Great Britain and Ireland	3,730,000	4				
Total for Europe	972,824,000	30	2.5			
United States of N. America	550,000,000	27	7.5			
East India, British	160,000,000	20	1	40	60	

The percentages of forest area varies from 43 to 4, and the area per head of population from 9.9 to 1 acres. This shows that the general conditions in the various countries must make different demands in respect of afforestation. Servia, Russia, Sweden and Norway may as yet have more forests than they require for their own population. On the other hand Great Britain and Ireland, Portugal, Denmark, Holland, Belgium, and even France and Italy have a smaller forest

...ich differ altogether from those found

(b) Corporations, endowments
(c) Private pers

...rom these countries to Great Britain

DEFORESTATION IN RUSSIA

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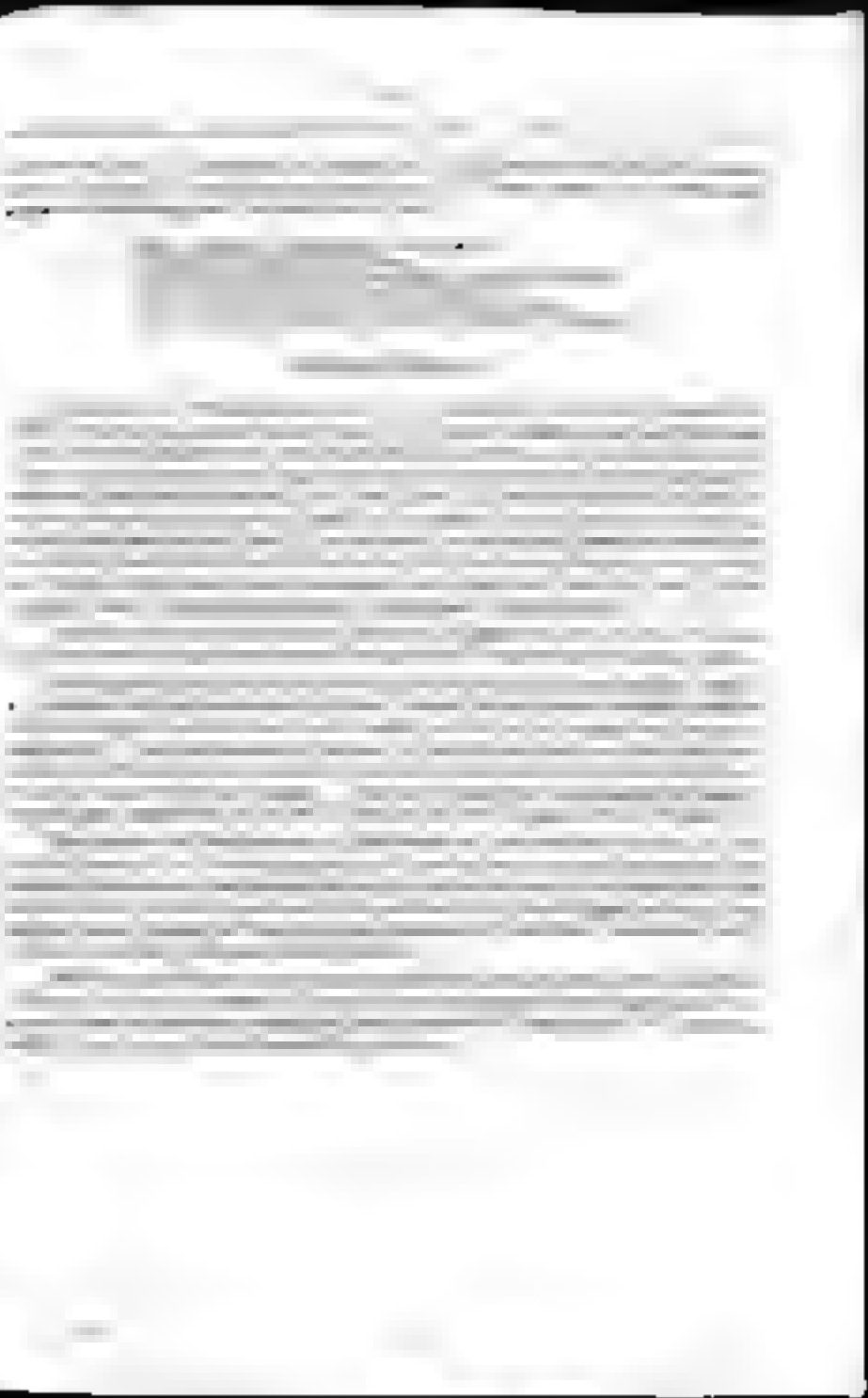
A PLEA FOR PLANTING

When I came to live here (1770) there were



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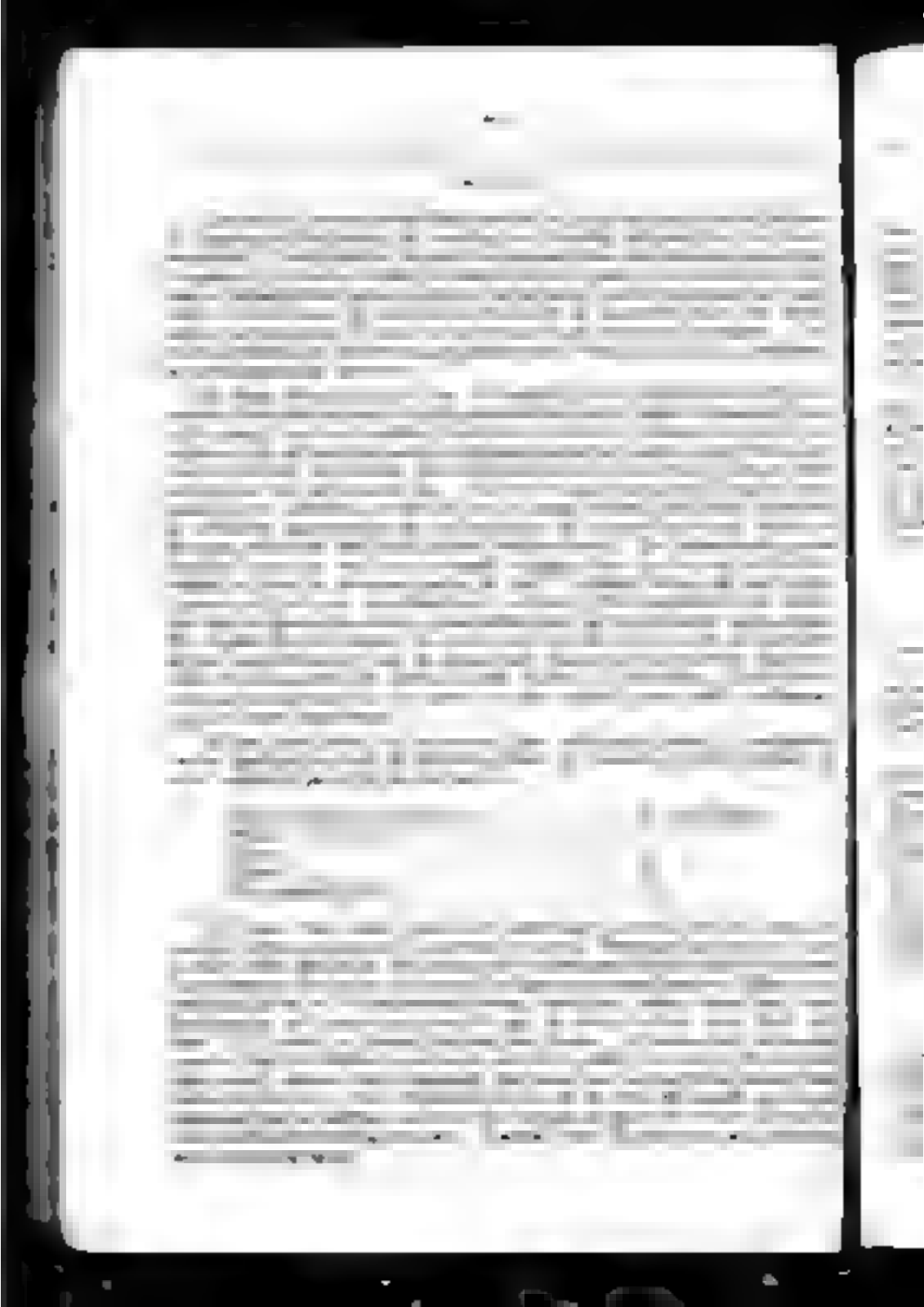

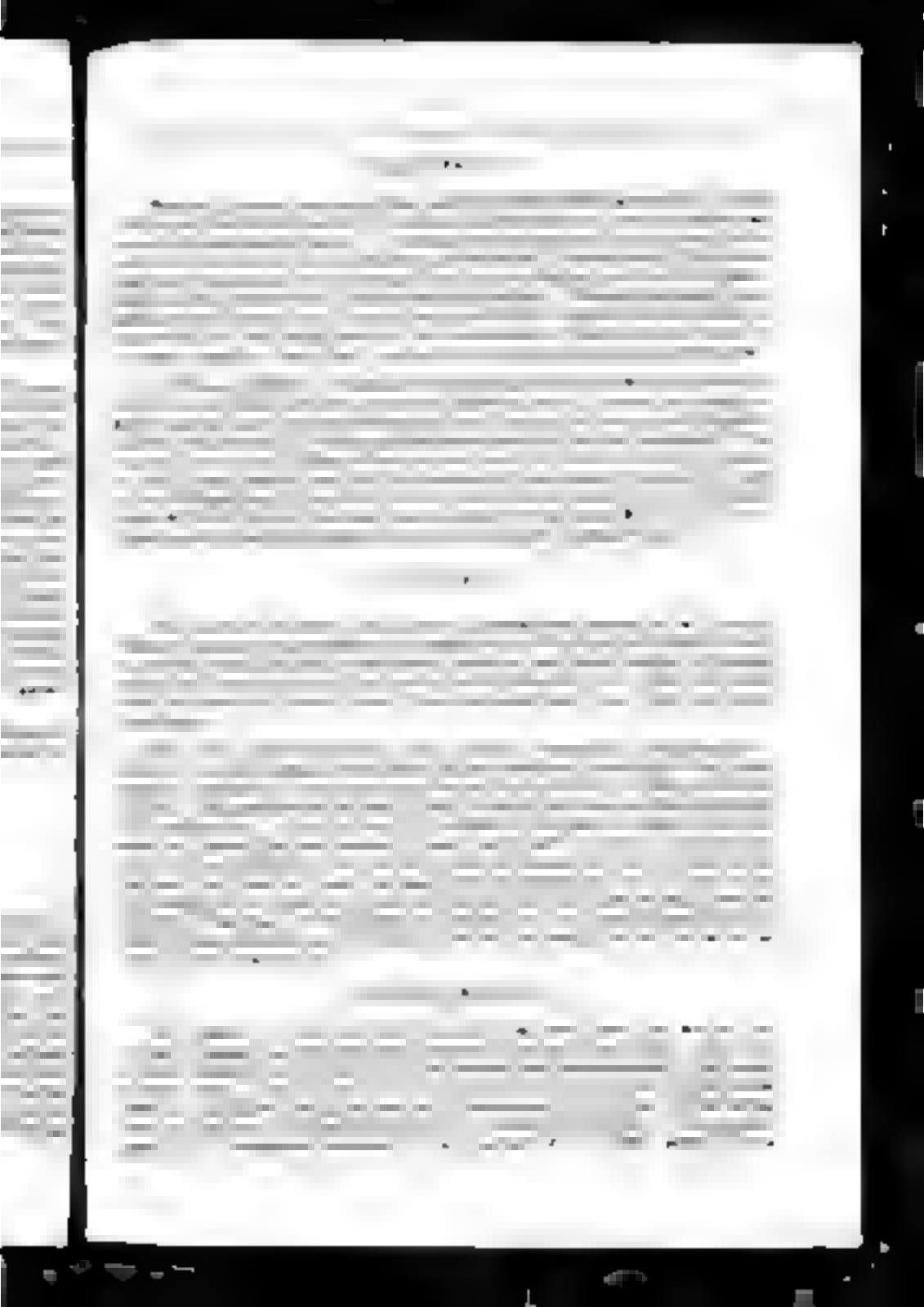

The Production of Wood P

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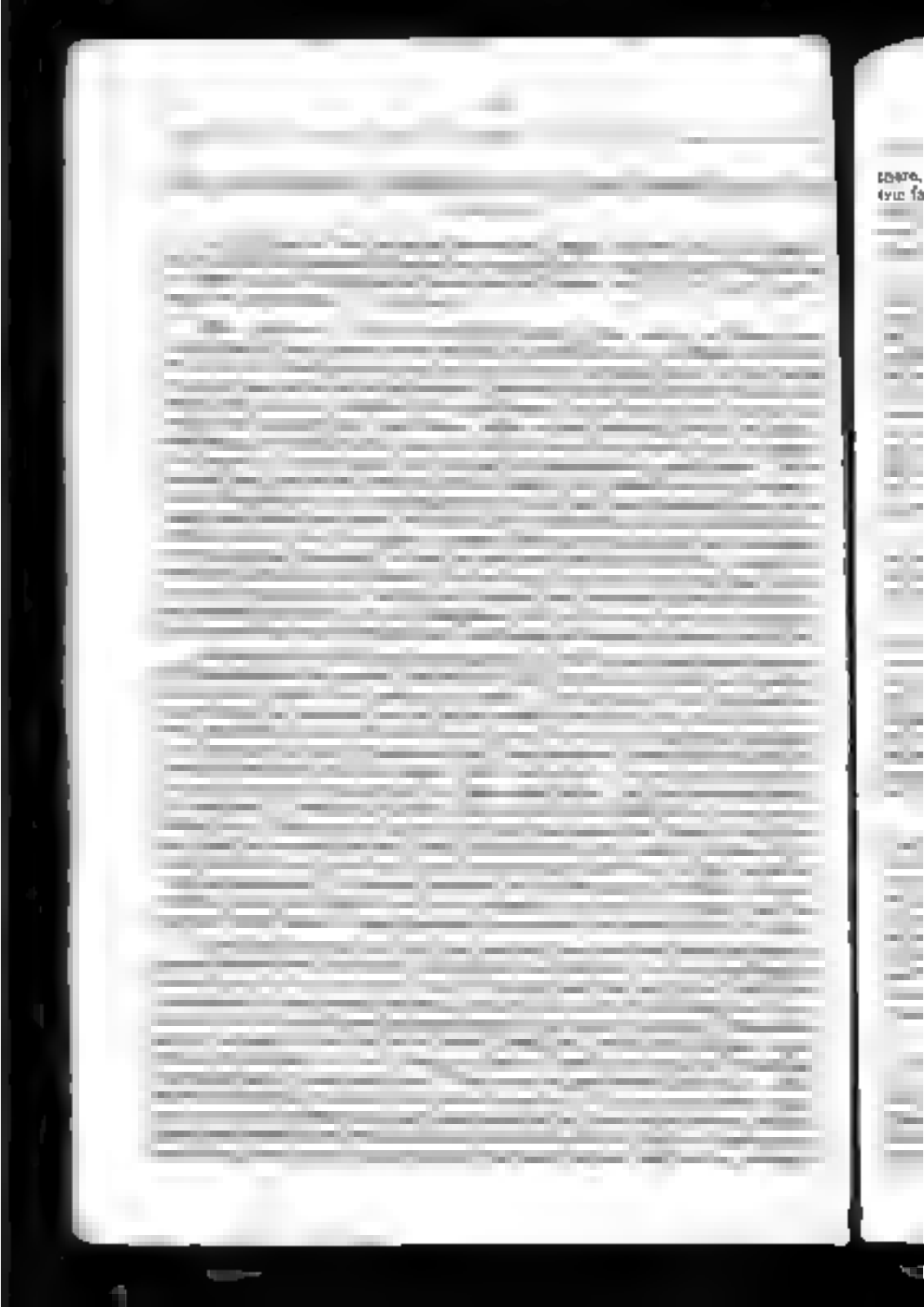


recore, is rudely parallel to the general ge

Forest trees east of the Rocky Mountains may be divided into four groups as regards their geographical distribution within the Dominion.

1. A northern group, including the white and black spruces, larch, Banksian pine, balsam fir, aspen, balsam poplar, canoe birch, willows and alder. These cover the vast territory down to about the one of the white pine.

2. A central group of about forty species occupying a belt of country from the white pine line to that of the butternut.

3. A southern group, embracing the tulip-wood, black walnut, the hickories, chestnut, hop tree, prickly ash, sour-gum, sassafras and flowering dogwood, which are found only in a small area in the southern part of Ontario.

4. A western group, consisting of the ash-leaved maple, burr oak, cottonwood, and green ash, which are scattered sparingly over the prairie and wooded regions west of Red River and Lake Winnipeg.

In the western peninsula of Ontario the forests present a remarkable richness in the number of species to be found growing together, in some localities as many as fifty different kinds may be counted on a single farm lot. A more varied mixture is probably not to be met with in any other part of the continent or perhaps in the world.

LEVELS OF THE OTTAWA

The following tables from the reports of the Geological Survey (Canada) show the levels at various points on the St. Lawrence Ottawa and Mattawa rivers, from Three Rivers to Lake Nipissing.

Levels of the Ottawa above the waters of the St Lawrence at Three Rivers, which is about the highest point affected by the action of the tides

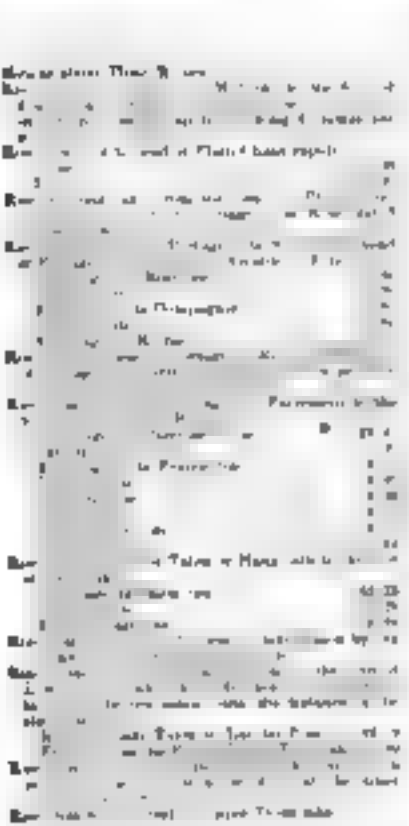
	Distance miles.	Rise ft. & in.	Total rise ft. & in.	
Rise from Three Rivers to Montreal harbour, as stated in a report of the Hon. H. H. Killaly, President of the Board of Works in 1845	80	19.9	19 9	Montreal
Rise from Montreal harbour to the St. Louis at Lachine, from the same report				
lock		18 8		
2 "		13.3		
3 "		6.8		
4 "		9.0		
5 "		0.9		
	10	48.9	67 8	Lachine
Rise in lake St. Louis from Lachine to Ste. Anne	15	0.6	68.0	
Rise in Ste. lock at Ste. Anne		3.9	01 0	
Rise in the lake of Two Mountains from Ste. Anne to Carillon	23	0.8	41 8	Carillon
Rise from Carillon to Bleeders.				
1 lock up		10.0		
2		7 0		
		21		
3 lock down		13		
	45	8.0	60.8	
Rise in Chute à Blondeau		4.0	72.8	
Rise in the Grenville canal from the head of Chute à Blondeau to the level of Grenville canal				
1 lock		9.0		
2 "		9		
3 "		8		
4		8		
5		7		
6		6		
	6½	55.0	100.8	Grenville.
Rise in the navigable part of the Ottawa, between Grenville and the entrance to the Rideau canal.	36½	0.4	101.2	Ottawa.
Rise from the entrance of the Rideau canal to the Chaudière lake. viz. Rise in the Rideau canal to Dow's Swamp				
lock		10		
2		24		
3		30		
4		10		
5		80		
6		10		
7		10		
8		10		
		84		
Fall from Dow's Swamp to Chaudière lake	15	6	95 0	Chaudière.
Rise in Chaudière lake from the foot to Fitzroy Harbour at the head, supposed to be one inch per mile.	26	2	185.1	
Rise from Fitzroy harbour in Chats lake as determined by levels taken up the Mississippi channel by the Board of Works in 1845, & 46, say	9	80.0	263 1	Chats.
Rise in Chats lake from the head of the Rideau to Chats to the foot of the Chenaux, supposed to be one inch per mile	15	2.5	291.4	

ye poe talle
re from the foot of the c

Levels of the Ottawa above the waters of the St. Lawrence at Three Rivers.—Continued.

	Distance miles.	Rise. ft. & in	Total rise ft. & in	
Rise from the foot of the Deux Rivières rapid to the head of the Lower rapid, at the Dividing Island between upper and lower Portage	15 35			
Difference of level between the heads of the Deux Rivières Portage and the mouth of the Magantoup	0 55			
Waterway or level between the mouth of the Magantoup and the head of the Lower rapid	0.03	2	99.4	605.6 Lower.
Rise from the head of the Lower to the foot of the Mattawa rapids, being the set water mark, the whole distance supposed to be 6 in. per mile	18	9.0	514.5	
Rise from the foot of the Mattawa rapids to the mouth of the Mattawa river	1½	6.0	508.5	Mattawa.
Rise from the mouth of the Mattawa to the foot of the Calm rapid, a considerable current about mid-way up, 10 inches per mile	5½	0 10	507.8	Calm.
Rise from the foot of the Calm to the head of the Chaudron rapid, viz.				
Rise in the Calm	6 10			
Rise in the Grandeur	0.00	7	389.0	Chaudron
Rise from the head of the Chaudron to the foot of the Erables rapid, 3½ inches per mile	½	0	388.4	
Rise from the foot to the head of the Erables rapid.	½	13.0	515.0	Erables.
Rise from the head of the Erables to the foot of the Mountain rapid, say 3½ inches per mile	5½	0	515.0	
Rise from the foot to the head of the Mountain rapid		6.3	508.8	Mountain
Rise in the Seven leagues lake from the head of the Mountain rapid to the foot of the Long Sault rapids, say 2½ inches per mile	13	3.0	506.0	
Rise from the foot to the head of the Long Sault rapids				
1st or lower Cap	0 32			
Intermediate ½ mile	1 01			
2nd cap	0 16			
Intermediate 2-16 miles	1 20			
3rd or rocky rapid	4.38			
Intermediate 2-12 miles	1 23			
4th leap	13.02			
Set of upper rapid	1 34	5	93.6	004.4 Long Sault.
Rise from the head of Long Sault rapids to the mouth of the Ignatia river above the Galere carrol; here is a perceptible current only in two places, say 3 inches per mile	12	3.0	607.4	Galere.
Rise from the mouth of the Ignatia river to the head of Lake Temiscaming, say 7 inch per mile	75	4.3	612.0	Temiscaming.
Miles	222½			

Levels of the Mississippi from its junction with the Missouri 5 feet 7 inches above the surface of the St. Louis reservoir at Three Rivers or Trois Rivières



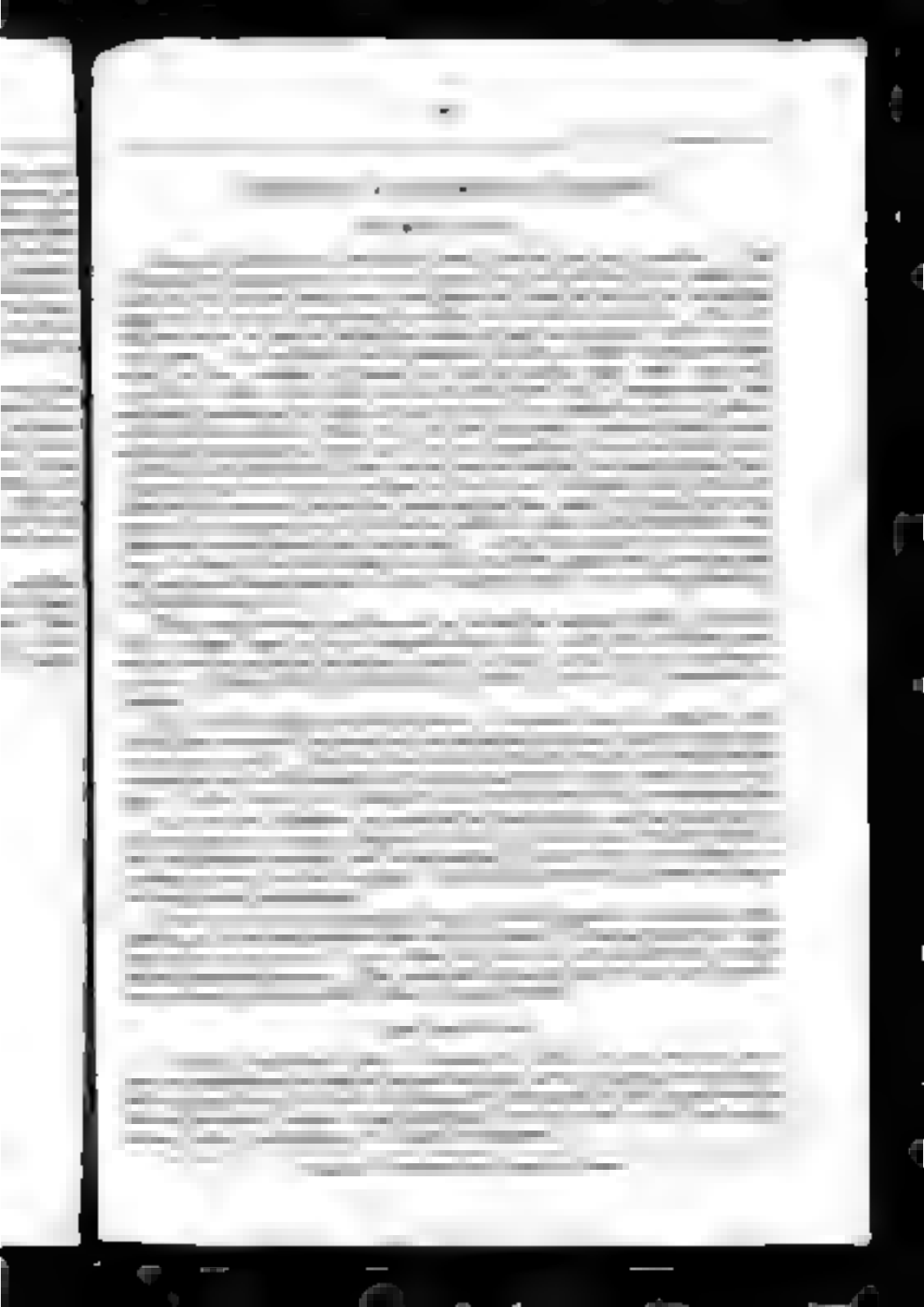
Levels from the surface of Lake Nipissing, 665 feet above the waters of the St. Lawrence at Three Rivers, to that of Lake Huron, at the mouth of the French River

	Miles.	Feet.	Total rise.
Height of Lake Nipissing agreeably to the estimate of Mr. Wm. Hawkins in his report to the Commissioners of the Lake Huron and Ottawa Survey in 1837 the fall, in the French river 665			
1 Chaudiere falls (upper) 10.0			
2 Chaudiere " (lower) 15.0			
3 Rapids 3.0			
4 " 3.6			
5 " 3.0			
6 " 3.0			
7 " 2.0			
8 " 5.0			
9 " 4.3			
10 " 3.9		66.6	
Allowance for the supposed general slope of intermediate parts of the river, say 1 inch per mile	55	17.4	84.0
To the level of lake Huron			681.0
The ascertained height of the surface of lake Huron above the sea, according to the Michigan Surveyors			678.0
Making a difference of			3.0

The yearly consumption of osiers in England is far greater than the national supply and as the basket industry is constantly on the increase it would also on this account be advisable to further the cultivation of the osier willows. For light sandy banks, the best willow should be Salix purpurea, and as it is so easily propagated it will well repay the cost of cultivation, besides binding the banks making boat fast and adding to the beauty of the locality as well as that of the water. For more clayey soils, S. viminalis and the more celebrated S. caprea so much sought for powder factories, should be the best. The cuttings must be taken from the one or two-year-old shoots and 9 put 1 to 1½ foot apart in double or treble rows 2 to 3 feet apart, care being taken to leave only half an inch or less above ground.

There are many localities where comparatively worthless land, close to the mouths of rivers and canals, might be made highly profitable at the same time as the cultivation of it with the before mentioned trees and plants would improve the state of the fishing, and, before placing spawn and fish in any water, I consider it important to pay great attention to this question. Where few or no trees exist it will be necessary to cultivate them, and I feel certain that such proceeding will enhance the chances of the success of pisciculture. I will not here enter further upon the practical details of the question. These are bound to vary with the locality, and the local foresters will know how to deal with them.

In drawing the attention of the conference to this question, it is with the sincere hope that it may enlist your sympathy and that the public opinion may be won for it. That it is important for all fresh-water fishing is evident. That is one more reason added to the many why we should regard the forest as a precious heirloom to be deeply revered, properly used, and through careful maintenance descend improved and enriched to posterity.



1 The selection system

[redacted] ediate, to afford them the necessary lig

transplants.
plants were [redacted]

planting [illegible] on a considerable scale. It must, however, not be [illegible] that if the [illegible] of regeneration [illegible] time [illegible] the [illegible] increase of [illegible] make [illegible] where [illegible] the more artificial regeneration must be [illegible] more [illegible].

[illegible] thought [illegible] be avoided [illegible] case [illegible] regards [illegible] though perhaps not to an equal [illegible].

[illegible]

[illegible] the natural method of regeneration as in the case of all [illegible] and [illegible] the forester must chiefly take the following points into consideration:

(a) General objects of management.

(b) Species to be grown.

(c) [illegible] of locality.

(d) [illegible] forests.

(e) [illegible] and capacity of the staff.

Labour Required in Forestry

Forests require labour in a great variety of ways which may be brought under the following three heads:

(1) General administration, creation, tending, harvesting etc. or work done in the forest.

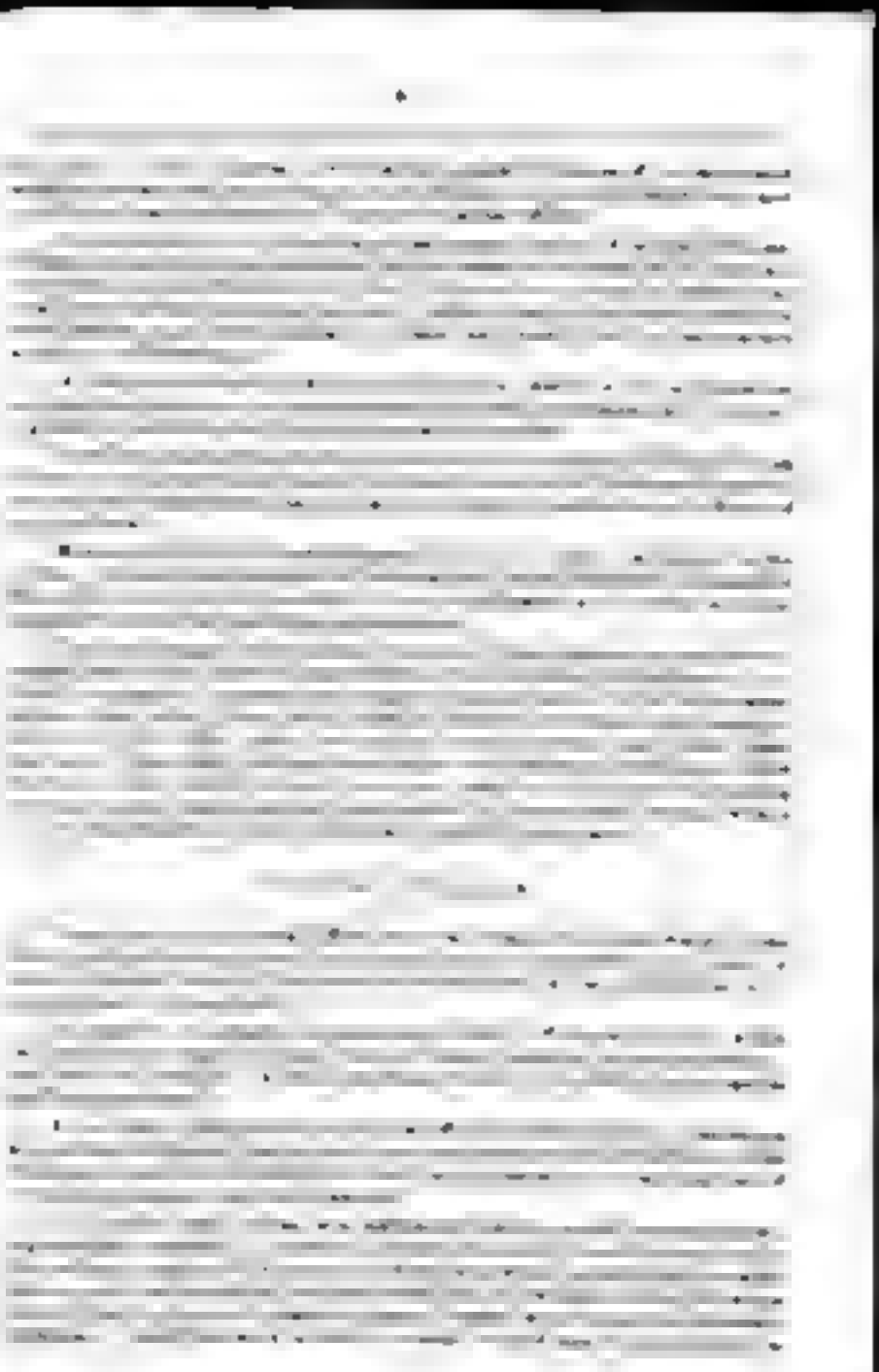
(2) Transport of produce.

(3) Industries which depend on forests for their prime material.

(1) [illegible] The amount of labour required in the forests [illegible] the [illegible] of making [illegible] which [illegible] be [illegible] [illegible] of [illegible] or [illegible] of [illegible] and [illegible] the [illegible] [illegible] and for [illegible] and [illegible] only [illegible].

(2) Transport of produce.—[illegible] of forest produce the transport [illegible] large [illegible] under this head [illegible] in [illegible] permanent.

(3) *Forest industries.*—The amount of labour required for working up the raw material [illegible] the forests is of a much greater extent than that required in managing the forests and in transport. There are the workmen employed in



FORESTRY IN THE COLONIES AND IN INDIA *

A circular containing questions relating to colonial timber was addressed by the Secretary of State for the Colonies to the administrative heads of the various British possessions in 1874, from the replies to which it appears that in none of the six Provinces of the Dominion had measures been taken to secure the replanting of leased areas or the afforestation by natural reproduction, notwithstanding an enormous and growing consumption.

In the Province of Ontario more than 87½ per cent. of the timber annually cut was exported, and looking at the magnitude of the timber area it was considered to be an object not worth while to prevent the threatened extinction of the chief article of trade in the Province.

In Nova Scotia the amount of timber annually cut was estimated to exceed by 2 per cent. the annual growth, which is to be cut each year without materially impairing the forests, while in Prince Edward Island the amount annually cut exceeded nearly by one-half the quantity which would represent a prudent rate of consumption.

The timber resources of British Columbia were declared by local authorities to be practically inexhaustible, but it is probable that should the whole stream of emigration be thrown upon British Columbia, a few years would make a very appreciable inroad upon the stock of mature timber at places accessible for the purposes of trade.

The importance of this trade to the commercial prosperity of the Dominion will be exemplified by the following table, compiled from statistics contained in returns issued by the Board of Trade.

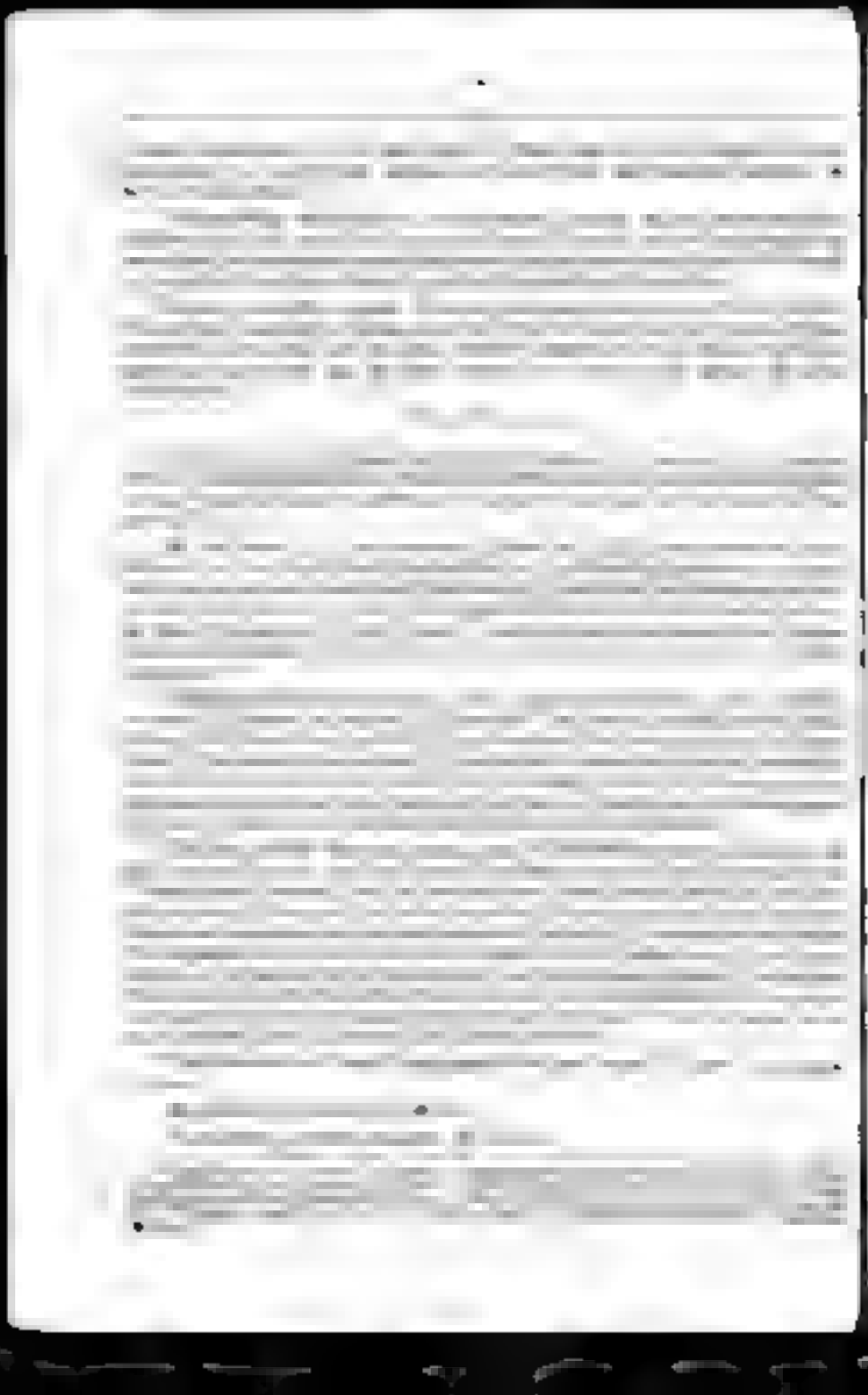
Quinquennial values of money values of timber and corn (grain) exported to the United Kingdom during five years ending 1876

Articles.	Value					
	1872	1873	1874	1875	1876	Total
	$	$	$	$	$	$
Timber and wood	4,718,845	5,280,356	5,703,707	4,326,943	5,342,601	24,482,252
Corn and grain	5,006,304	3,966,304	3,687,304	3,124,000	3,614,000	19,397,912

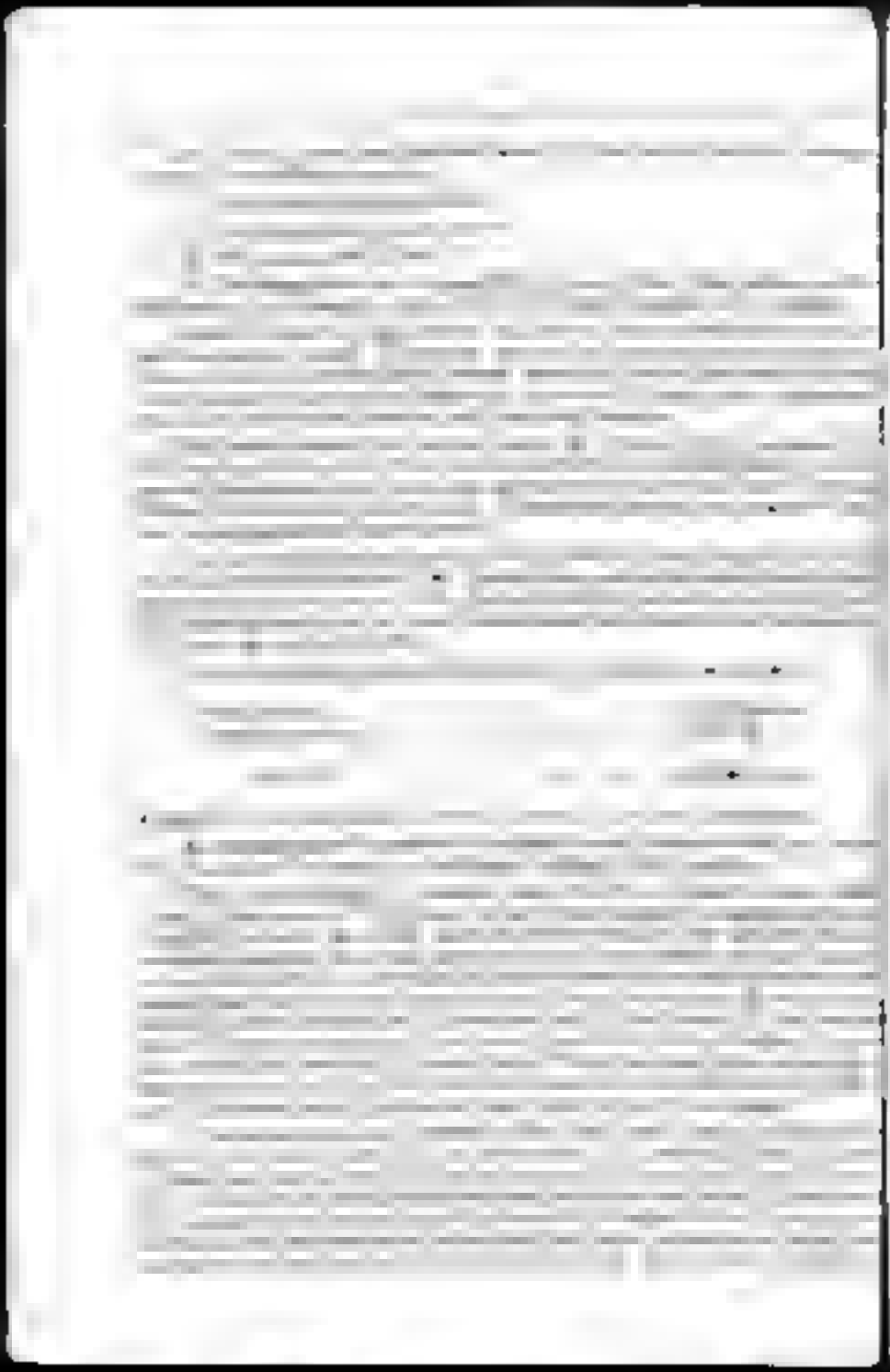
Timber and corn (grain) are the chief exports of the Provinces of the Dominion, and the value of the timber exported exceeds the value of the corn exported by more than one-third, and constitutes nearly one-half of the total value of all the exports from the Dominion to the United Kingdom.

The returns exhibit in a striking manner the urgent need for some prompt and complete intervention to stay the ruthless and wasteful destruction of the magnificent forests which constitute in many instances the principal natural riches of the colonies. There is a tendency in new and rapidly developing countries to regard the timber as

* British (in Proceedings of Royal Colonial Institute, vol. viii. 1876-77)



To control the management of the forests

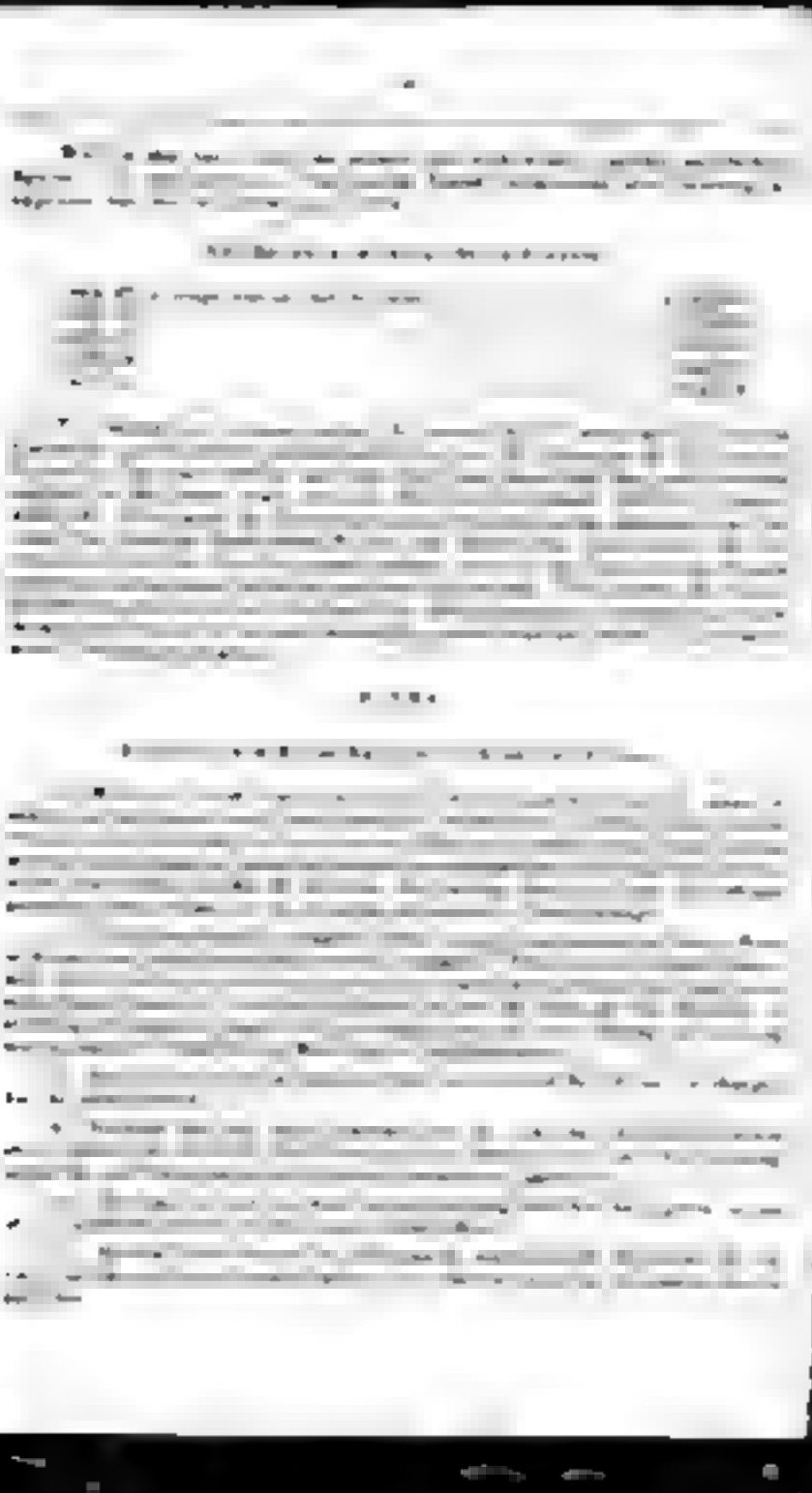


the reserved State

If we are to make over to
r must be treated in a sys-

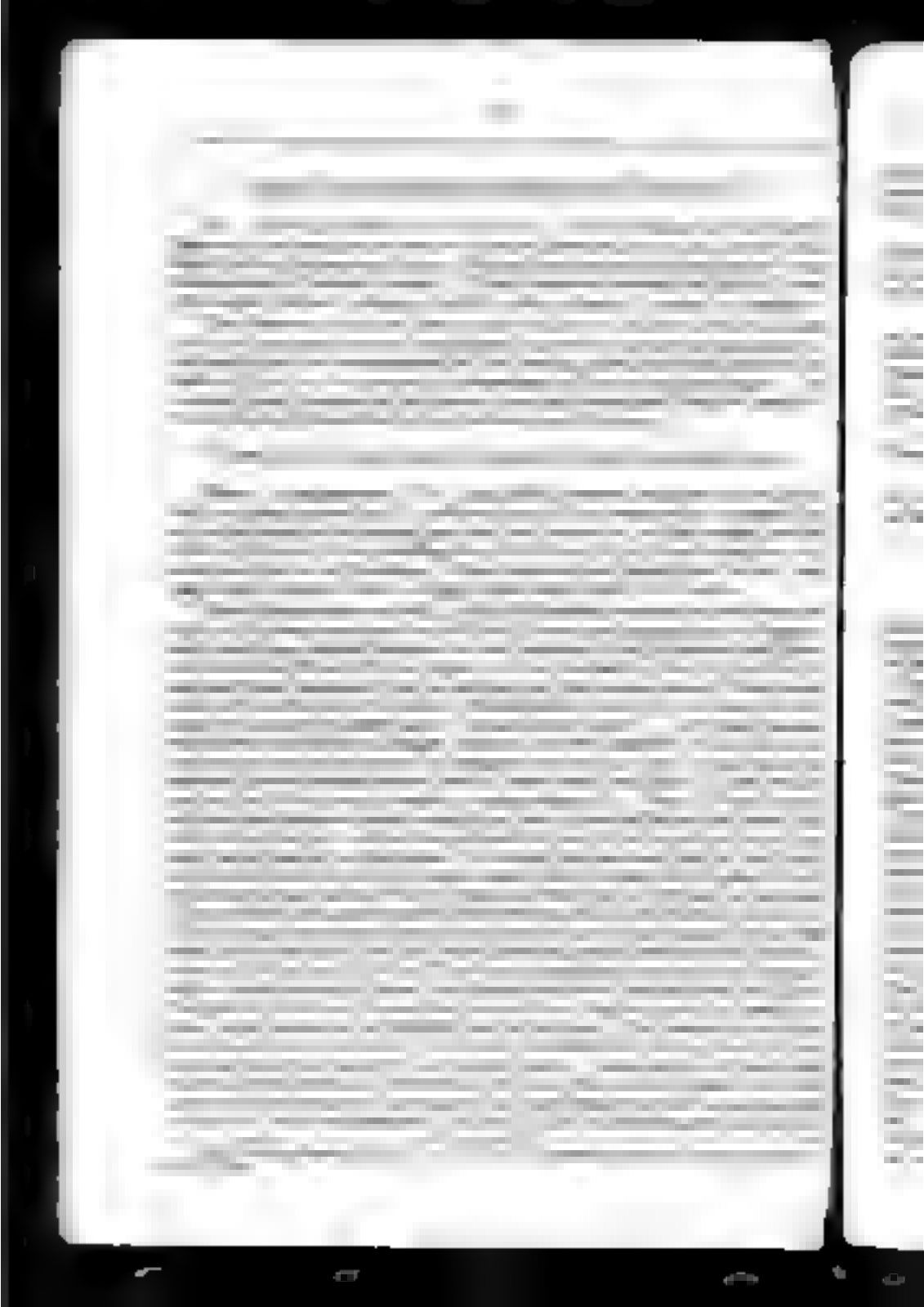
(3) Forest produce required by the

to took up forestry in a business-like manner

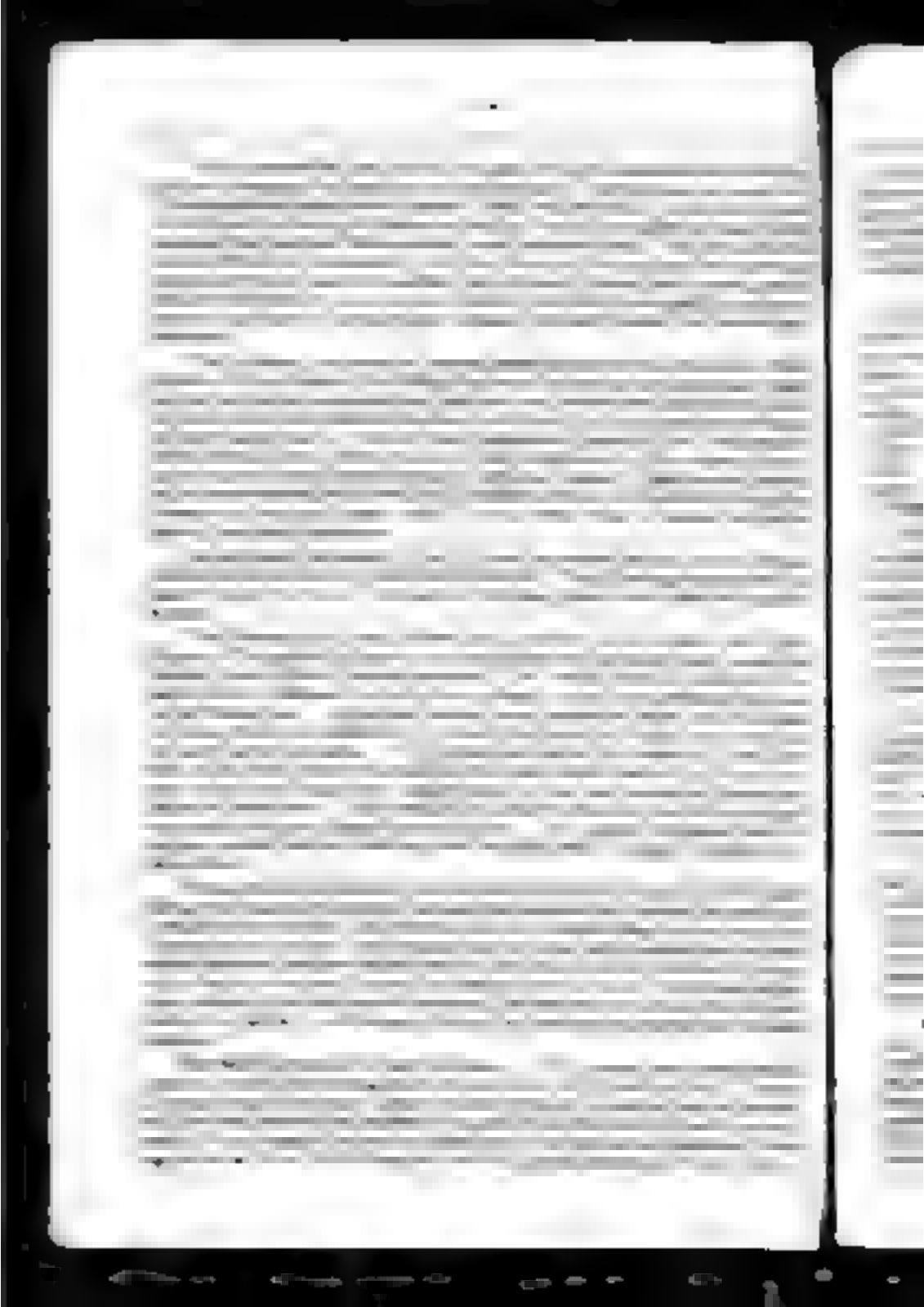


c) He shall have kindled such fire at a time when no high wind is blowing in the direction of the reserve.

Any person who, in contravention to this rule leaves any fire burning in such manner as to endanger a reserved forest, is punishable under section 26 of the Act with imprisonment for a term which may extend to six months, or with a fine which may extend to Rs. 500, or with both, in addition to such compensation for damage done to the forest as the convicting court may direct to be paid.



Utilization of Forest Products

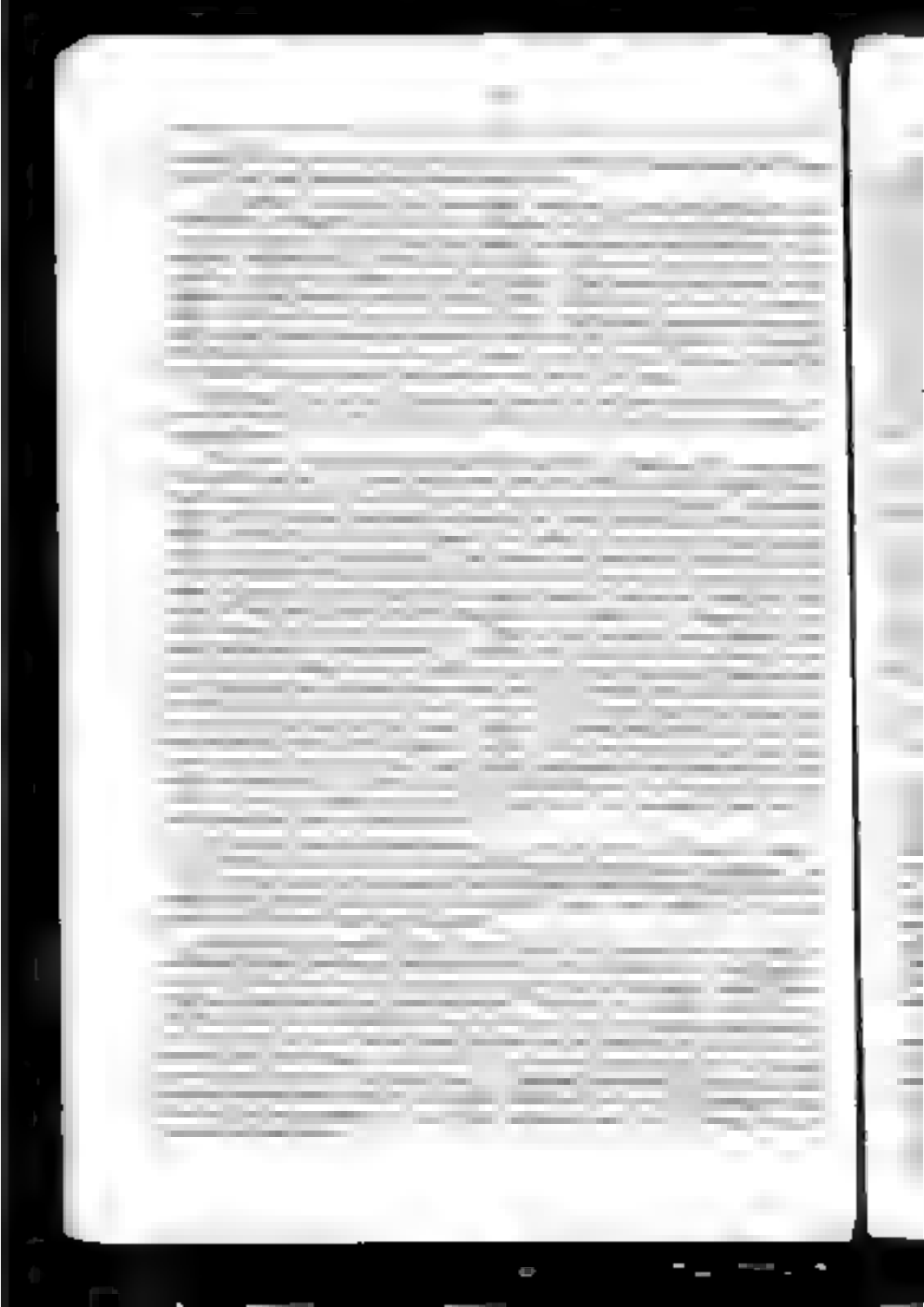


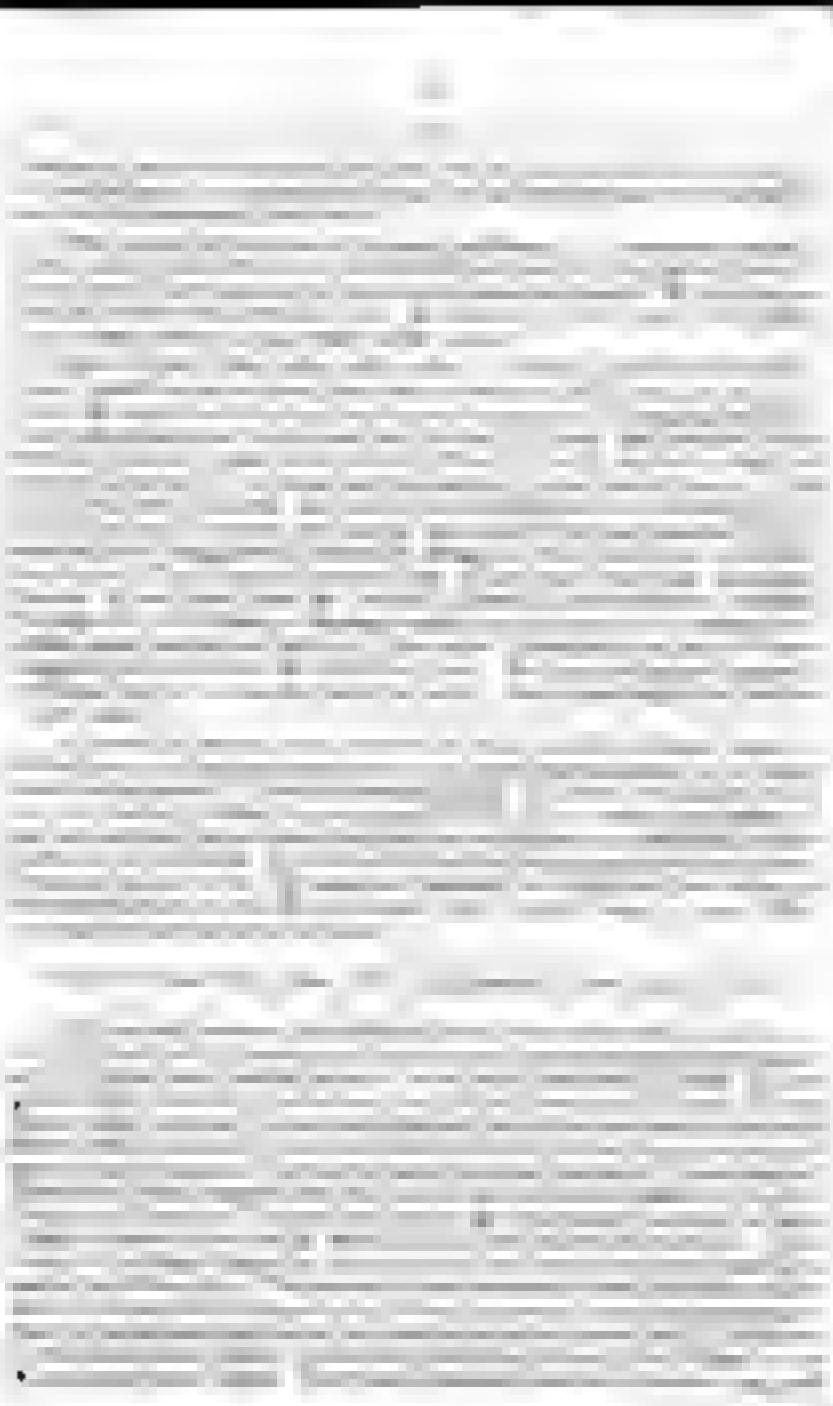
On alcoon lakes trees are always f

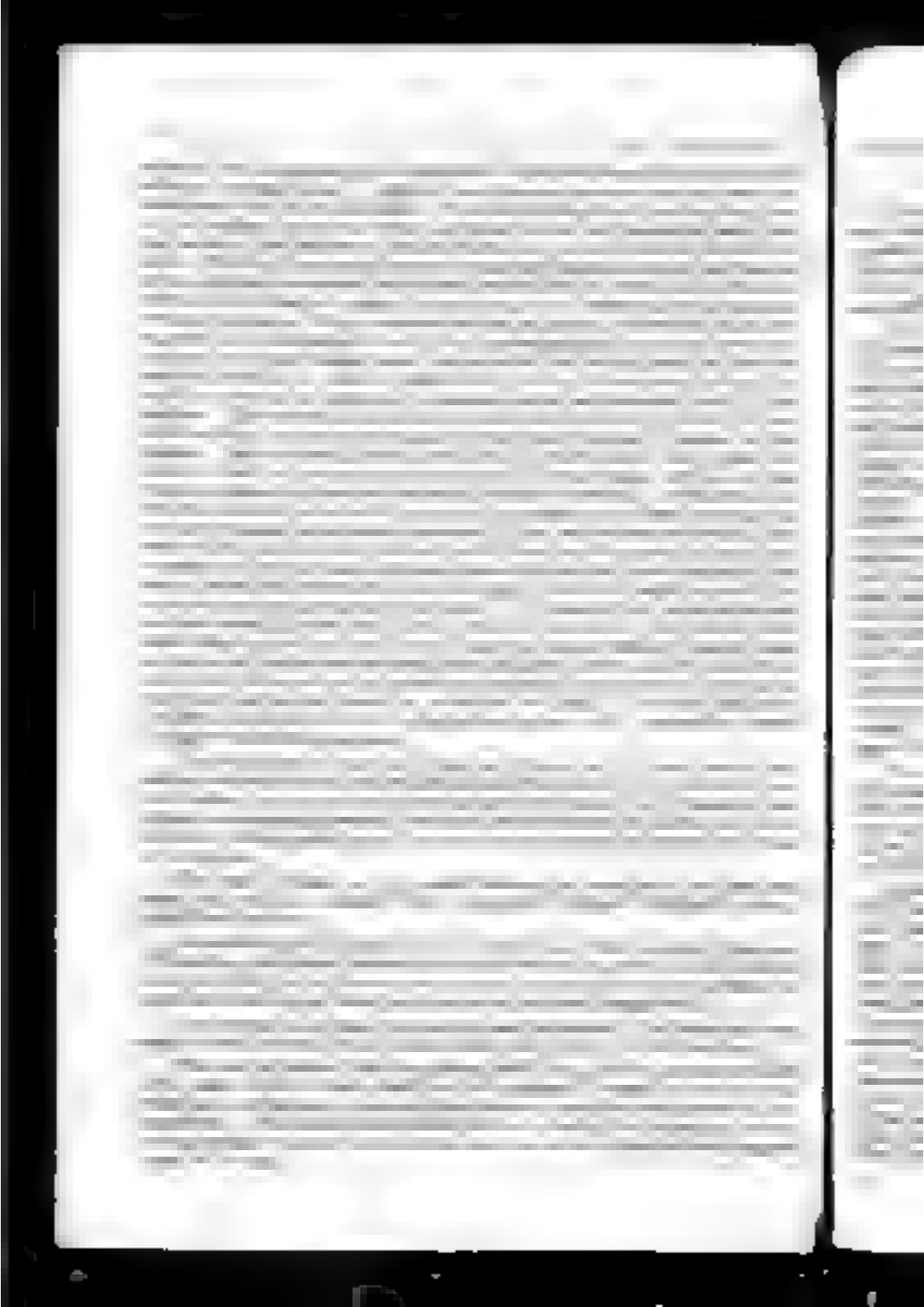
[illegible]

[illegible]

[illegible]

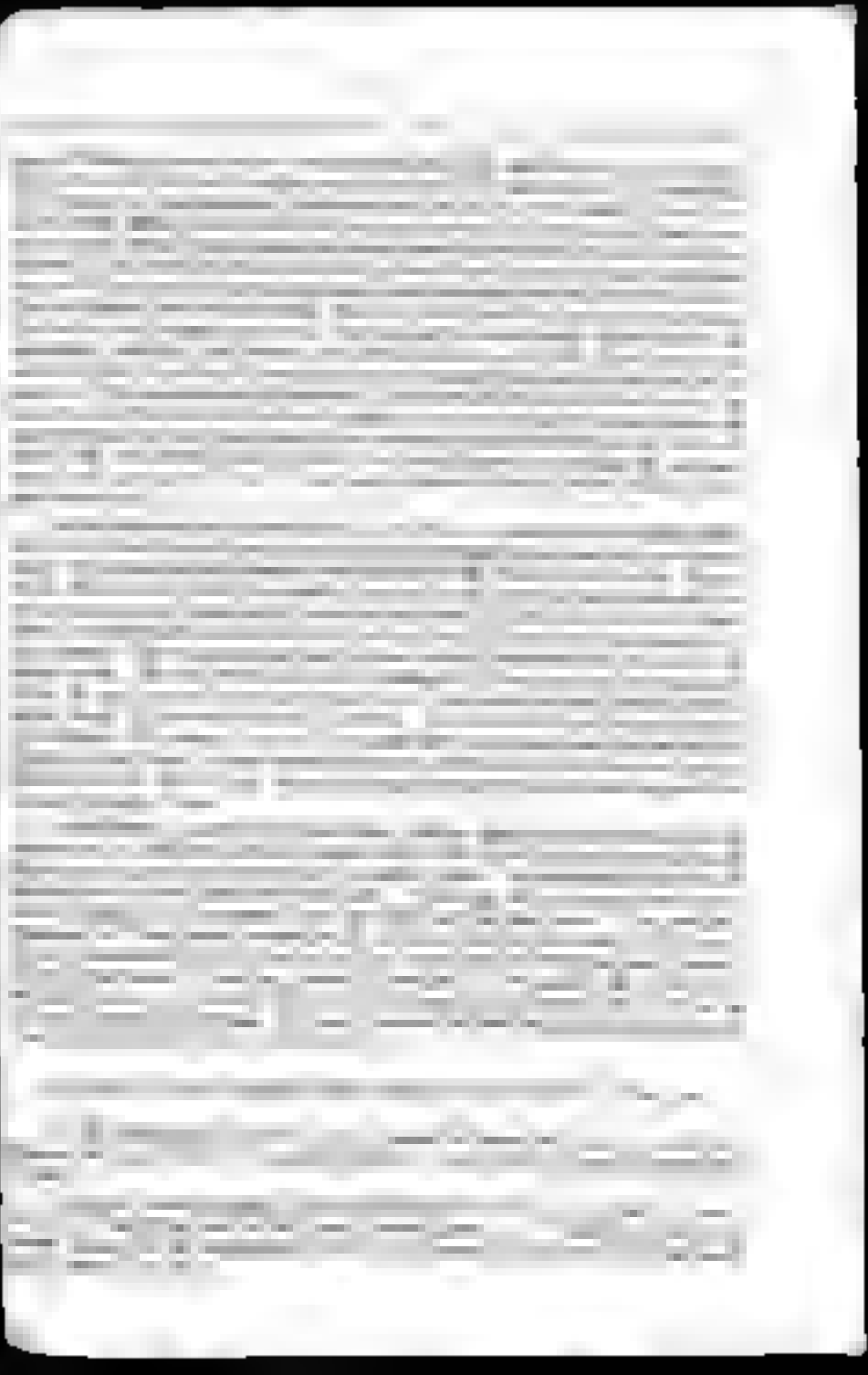






receive hides from all
them in all directions

the systems of
China however



33. Forest pasture can only take place between the months of May and October.

34. Before sunrise and after sunset cattle are not allowed in the forests exceptions may be made in those cases where on account of the distance the cattle must remain in the forest. In such cases, however they must be kept during the night in sheds, or within a ring fence.

35. Unless proprietors of cattle have a right to use certain paths the line of road to be used in going to the pasture grounds and watering places is indicated by the forest officers.

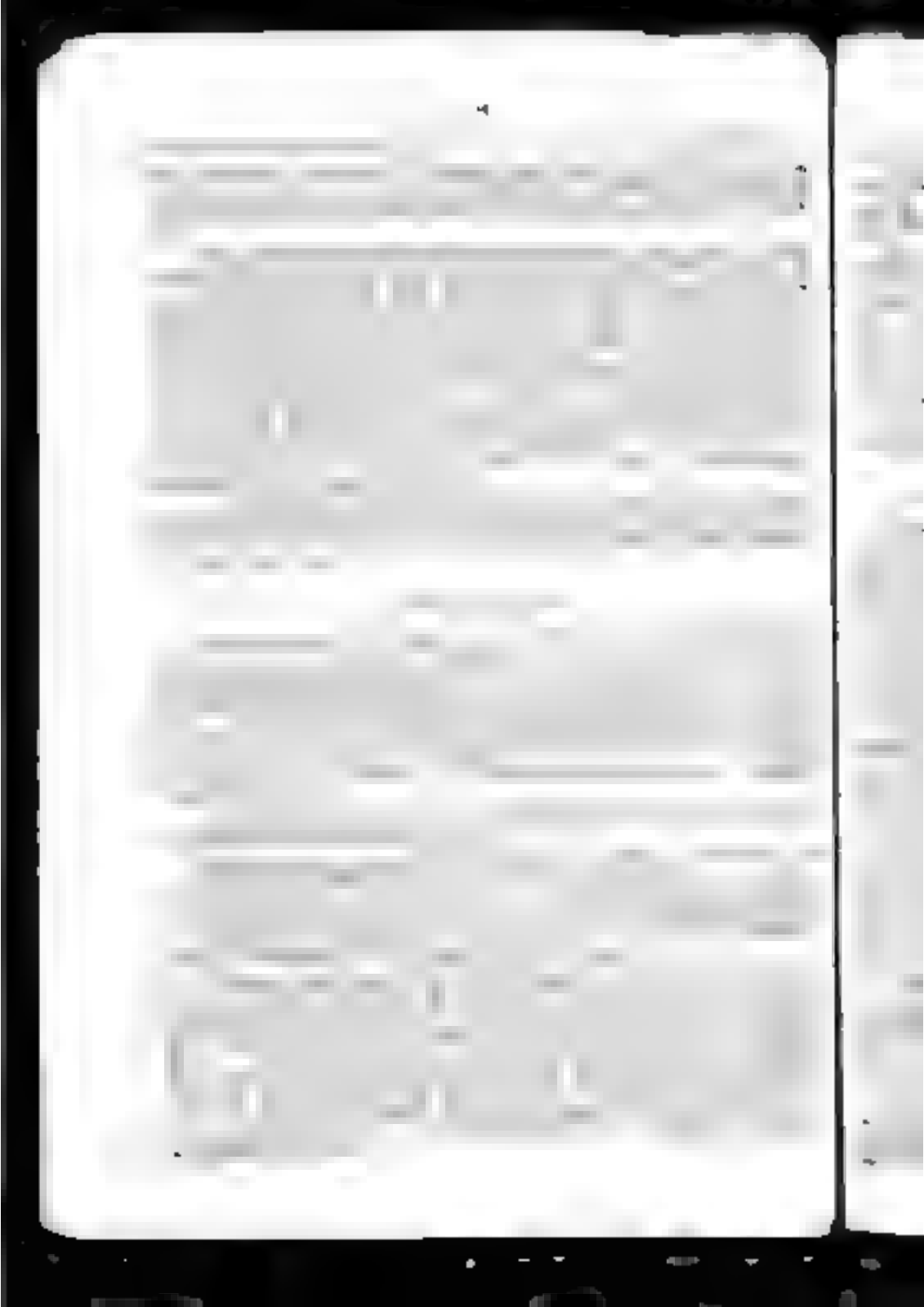
36. Sheep and goats are not admitted into the forests. In special cases exceptions may be made by the forest authorities with the consent of the forest proprietor.

37. Each head of horned cattle must be provided with a bell.

38. Each village community is obliged to employ one or several herdsmen for their cattle as may be necessary.

The members of a village community may not have their cattle herded in the forests nor may they send them with a herdsman of their own, separate from the herd of the village. Where a right of pasture does not belong to a village but to an association of proprietors they must entertain a common herdsman for their cattle. Single proprietors having rights of pasture entertain their own herdsmen.

e new clearings have little
nowhere. The value of



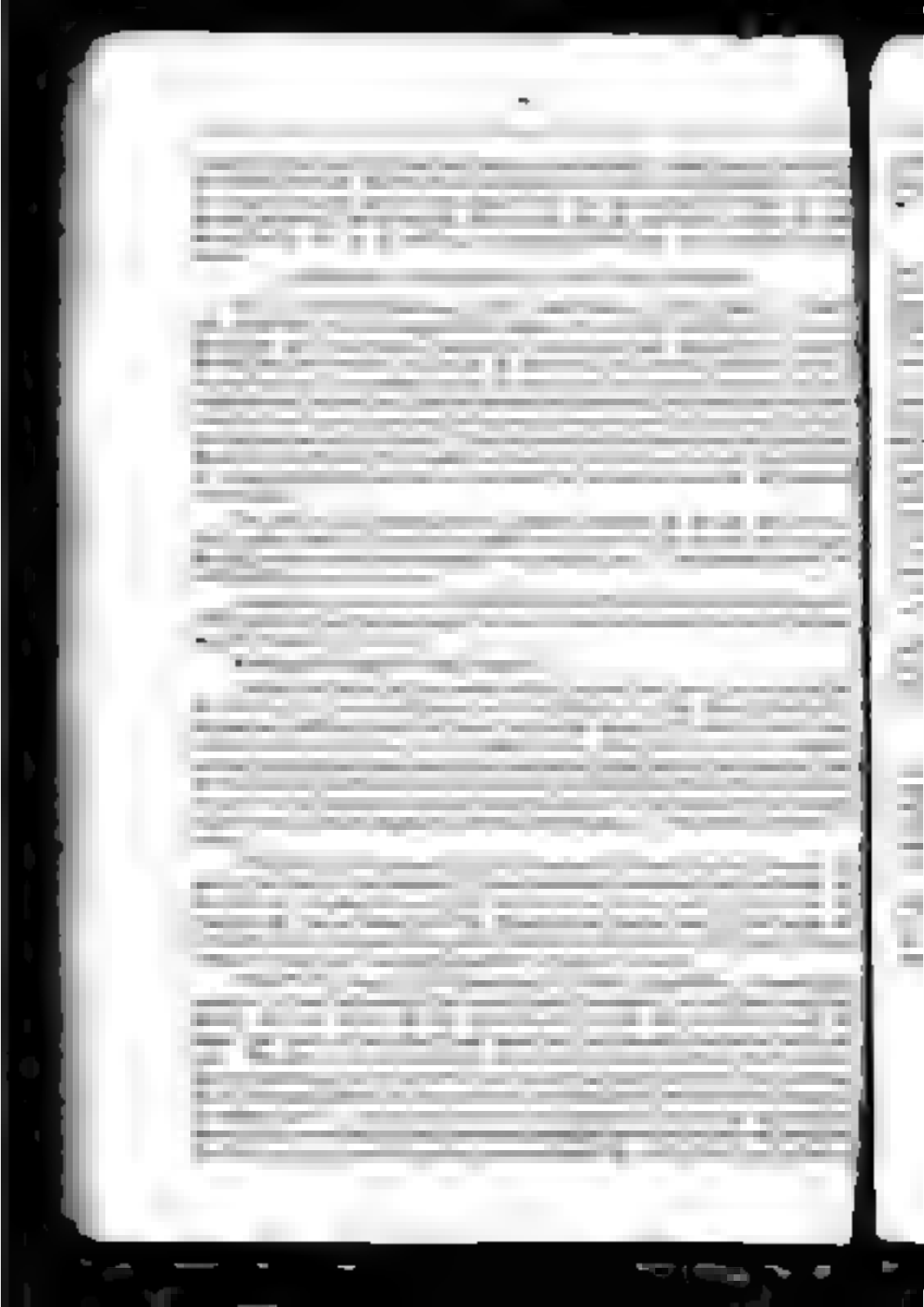
3 Italy had 17.04 per cent of woodland in 1872, a

have effectually prevented the adoption

Bavaria and Austria the
of the corresponding die

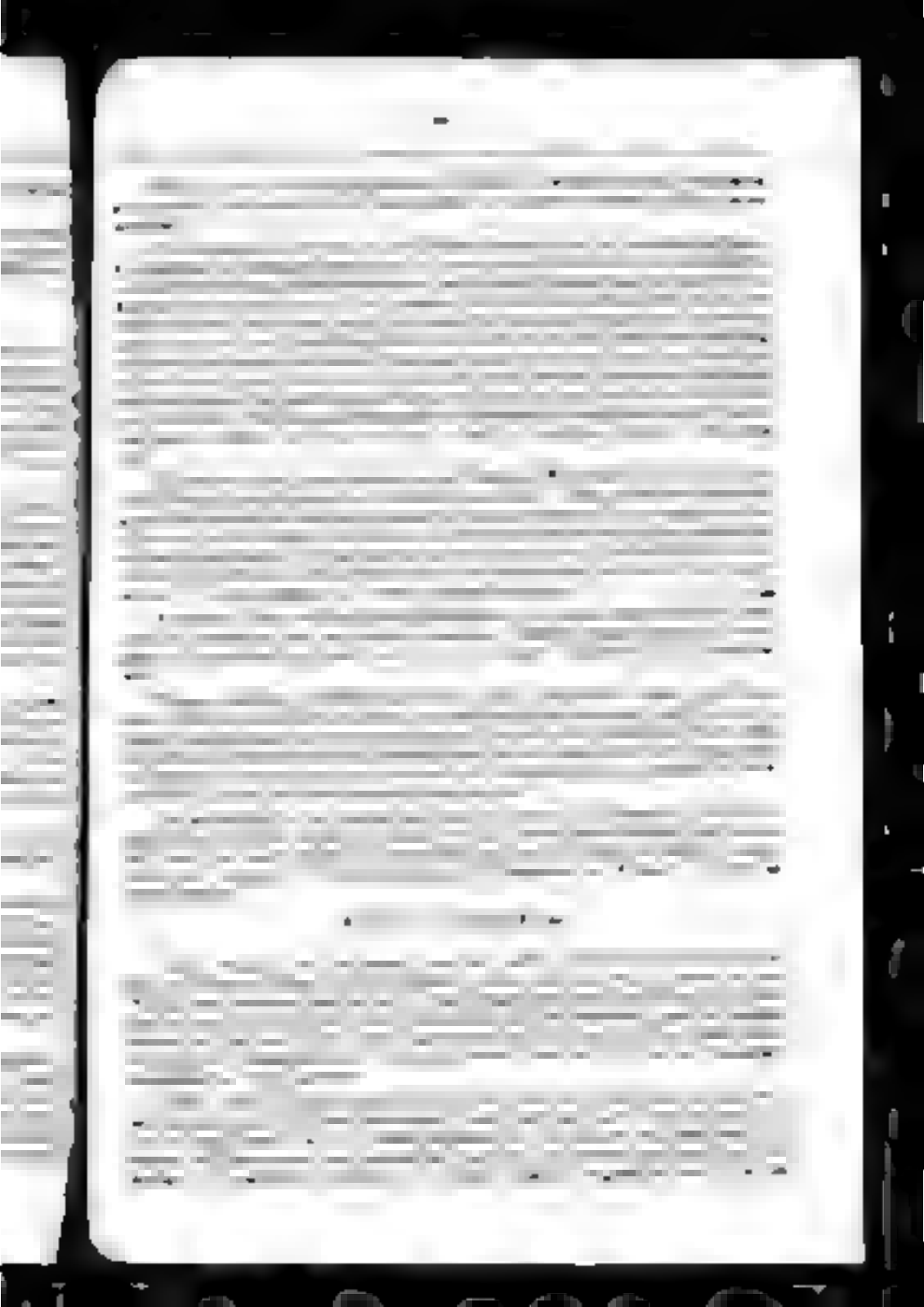
wind or by the axe of the woods

uency of late frosts at that season. AD



...s since the grove was felled, and the ground

In countries like the United States and Canada, wh...



[illegible] is cleared [illegible]

[illegible]

[illegible] the oak and the fir, bear a severer climate than the oak [illegible] bears

[illegible]

UNITED STATES CONSULAR REPORTS ON EUROPEAN FORESTRY

There is a great deal of useful information respecting European systems of forestry contained in a volume entitled "Forestry in Europe," published at Washington government Printing Office 1887 from which the following extracts have been made

COPY OF CIRCULAR.

DEPARTMENT OF STATE,
WASHINGTON November 30 1886.

To the Consular Officers of the United States

GENTLEMEN: You are requested to prepare a report covering the following questions on forest [illegible] and Forest Preservation, giving as much detail as possible upon each of the practical points. No question that may arise in your mind as to what may be pertinent in this country should be omitted as of great and pervading importance.

1. Area under forests, distinguishing, where possible, between State and private areas.

2. Common forests. If any and privileges of the population in them. If pasturage is permitted, how are the trees protected.

3. Organization and functions of governmental forest bureaus.

4. Revenues from government forests, cost of maintaining or managing forests, profits of forest cultivation.

5. Forest planting, and encouragements, bounties, if any; schools, their organization and courses of study.

6. Destruction of forests, causes and results.

7. Reclamation of sand dunes, or waste places by tree planting.

8. Sources of timber supply; trade in timber, boundaries of importation, if any, and customs duties.

9. Give the names of three reliable sellers of seeds and shoots in your district.

10. Transmit to the Department copies and translations of the forest laws of the district in which you reside. The general laws should be forwarded by the Consul General, the local laws, by the Consul.

I am, Gentlemen,

Your Obedient Servant,

JAMES D. PORTER,
Assistant Secretary

forests, by virtue of the local laws and regulations
however, to have access to these local

[illegible] Government Forest [illegible]

Th[illegible] of the [illegible] of the Kingdom of Austria [illegible]

[illegible]

[illegible] passing the [illegible] of the regular [illegible]

2. The [illegible] for the sake of [illegible] and [illegible]

[illegible]

The [illegible] regular forest [illegible] in the Empire are classified as follows:

A. [illegible]

[illegible]

B. Forest Technicists

[illegible]

Forest [illegible]

Forest wards, class I, salary per annum, [illegible] florins.

Forest wards, class II, salary per annum, 600 florins.

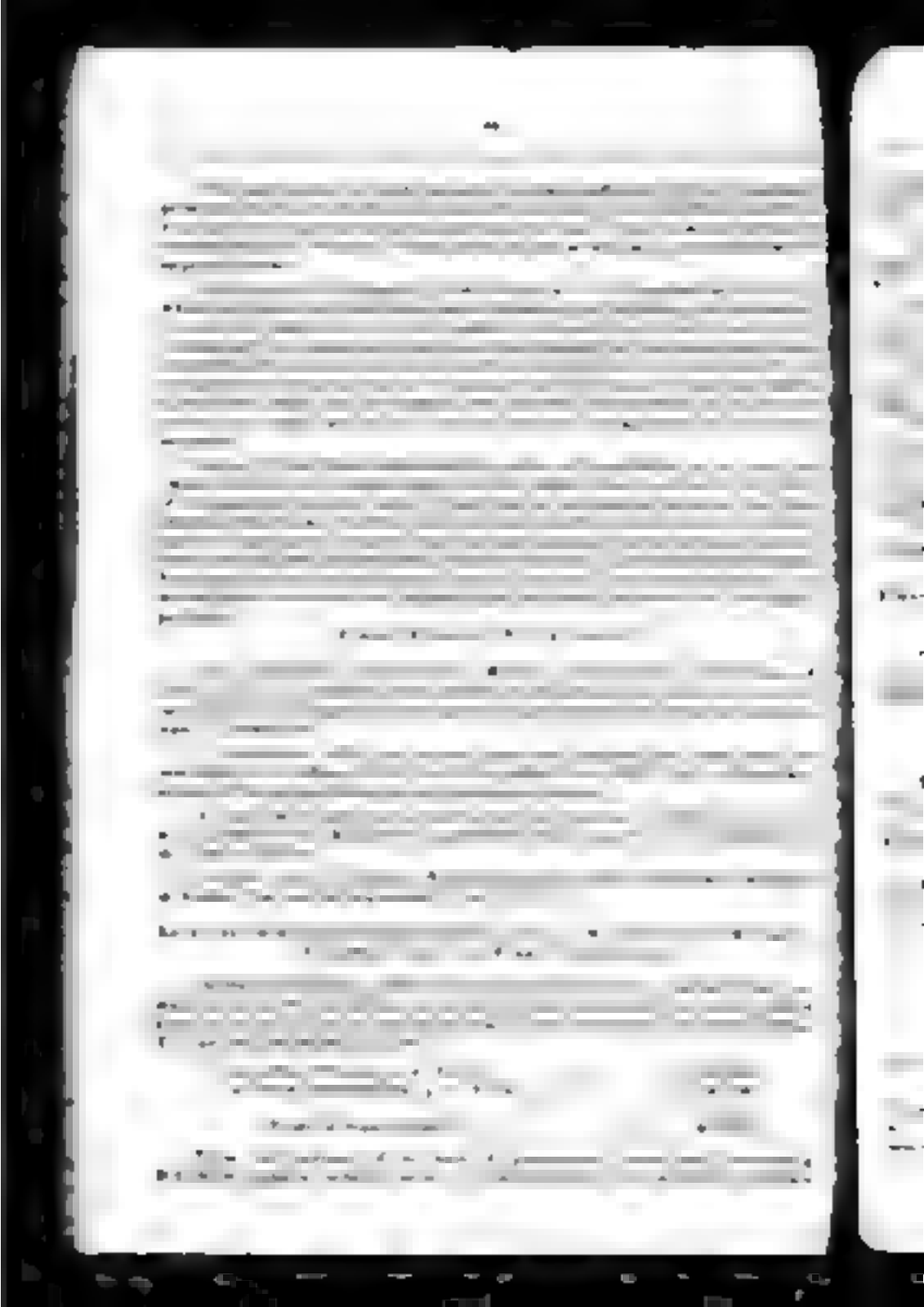
[illegible]

[illegible]

[illegible]

The [illegible] to make special [illegible] respecting [illegible]

Th[illegible] to inspect the offices of the district captains with reference to [illegible] affairs.



[illegible]

The laboratories tax is five florins for fifteen hours.

[illegible]

5. Mathematics.

8 Geodesy
7 Mechanics
8 Geometry
9 National economy

Second Group

1 Forest culture
2 Forest felling with forest technology
3 Forest preservation with forest zoology
4 Forest laws
5 Forest mensuration and management
6 Forest valuation
7 Forest engineering

The examinations are both oral and in writing during which the use of and reference to books and memoranda are not permitted

Ordinary learners who have performed the three years course in the university are admitted to examinations for diplomas

If the student desires to enter the service of the State as a forest officer he must submit himself to and pass two State examinations after he has obtained his diploma of learning

The subjects of the first State examinations are the following Physics, Mineralogy chemistry botany geology higher mathematics geodesy and national economy

The second State examination embraces the subjects of culture, the management of forest lands mensuration of values of forests forest machinery and forest laws

These State examinations are conducted orally and in public The State issues diplomas to the successful candidates

Middle or Preparatory Schools for Forest Officials

Three of these preparatory schools have been established in the Empire, one at Eisenberg another at Weissenseer and the third at Lemberg

The conditions of admission to the Eisenberg school are the following

1 The applicant must be a graduate of a lower gymnasium under gymnasium or a corresponding preparatory course

2 He must have served with good success for two or at the very least, one year as the apprentice of a forest official

3 He must not be less than seventeen and not more than twenty-four years old

4 Must be in perfect health and vaccinated

5 Must furnish security as to means required for instruction, clothing and support

6 Must pass a preliminary examination by the teachers of the school

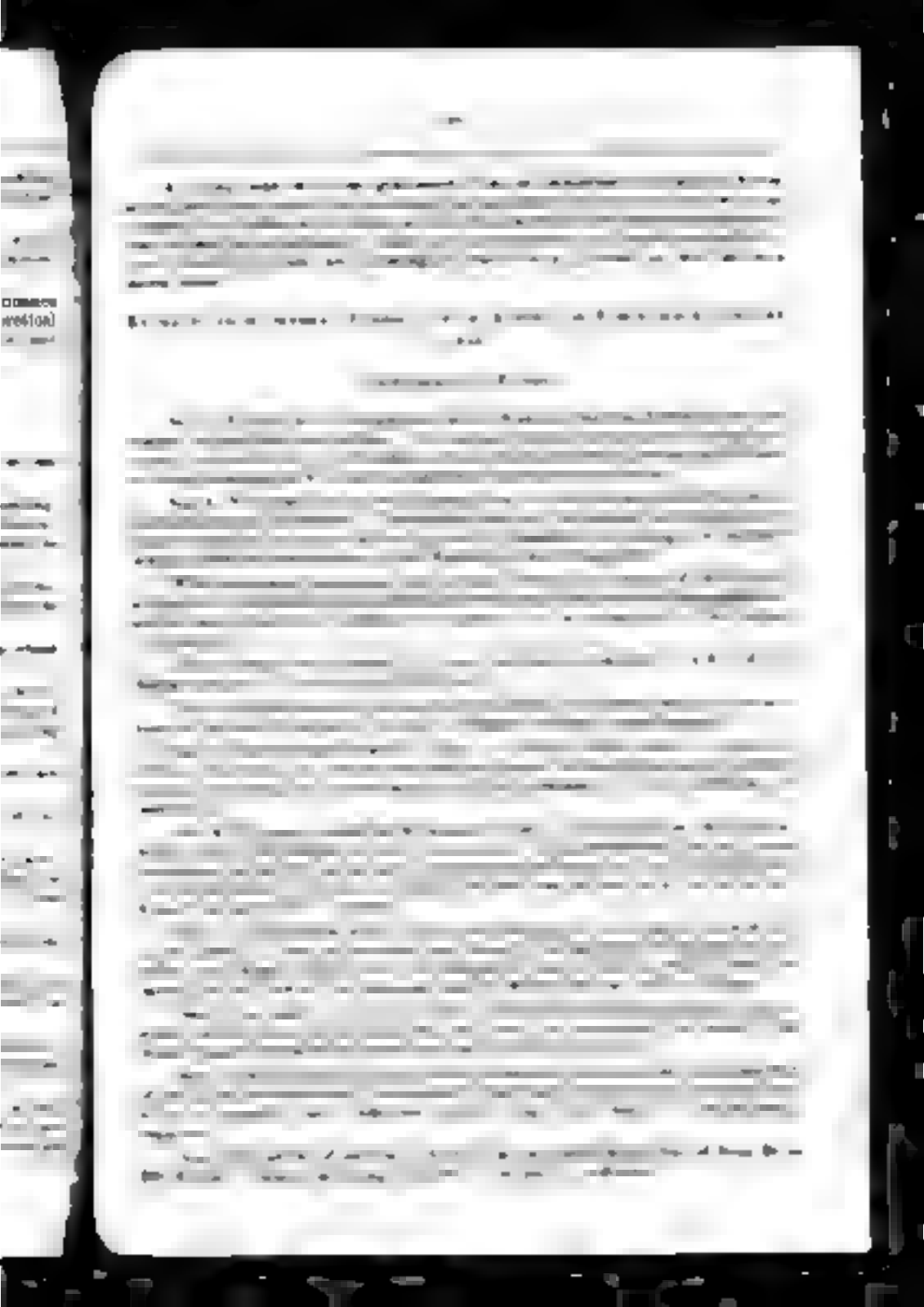
The ordinary whole number shall not exceed twenty to twenty-five per annum, viz at the institute

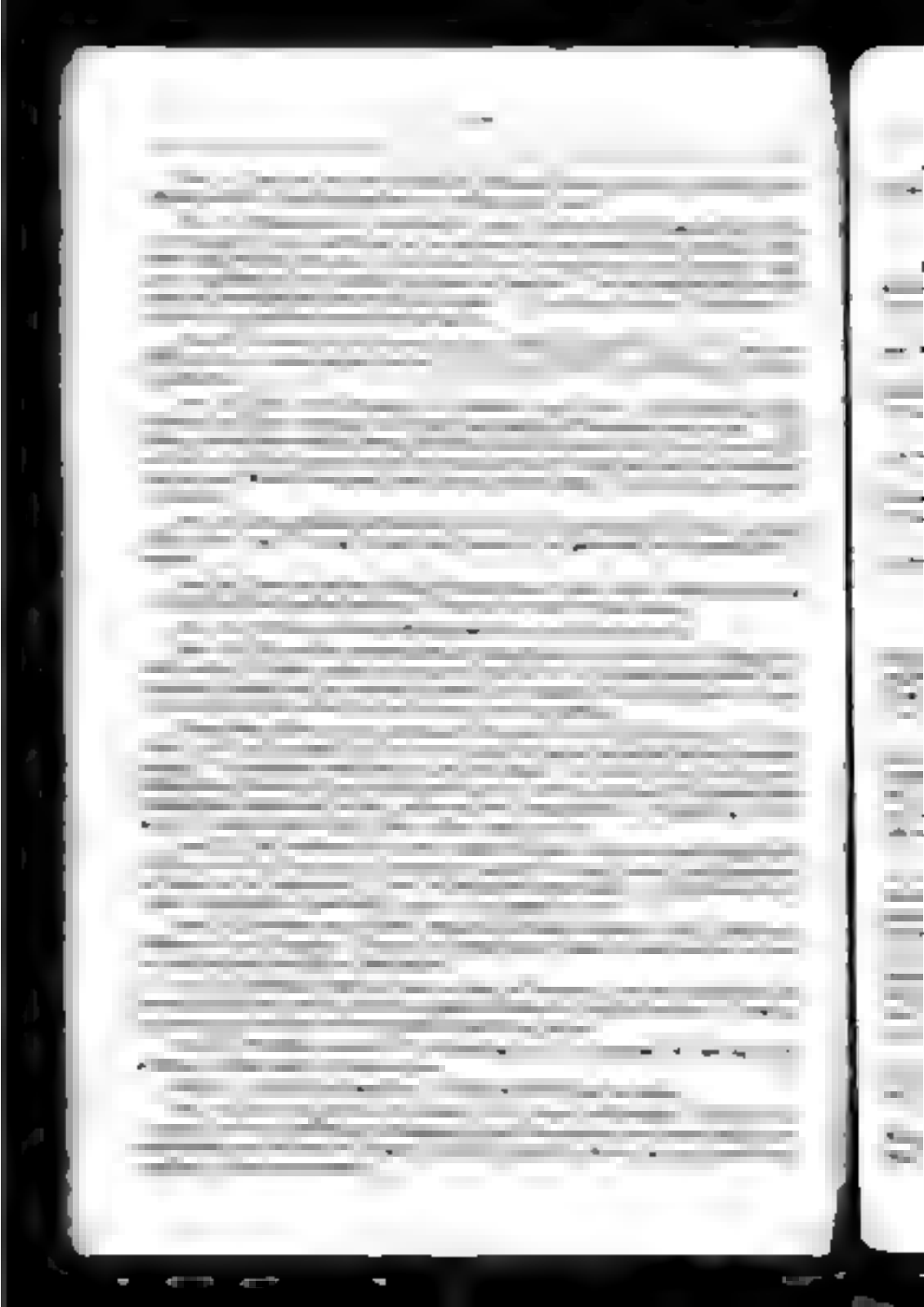
7 *

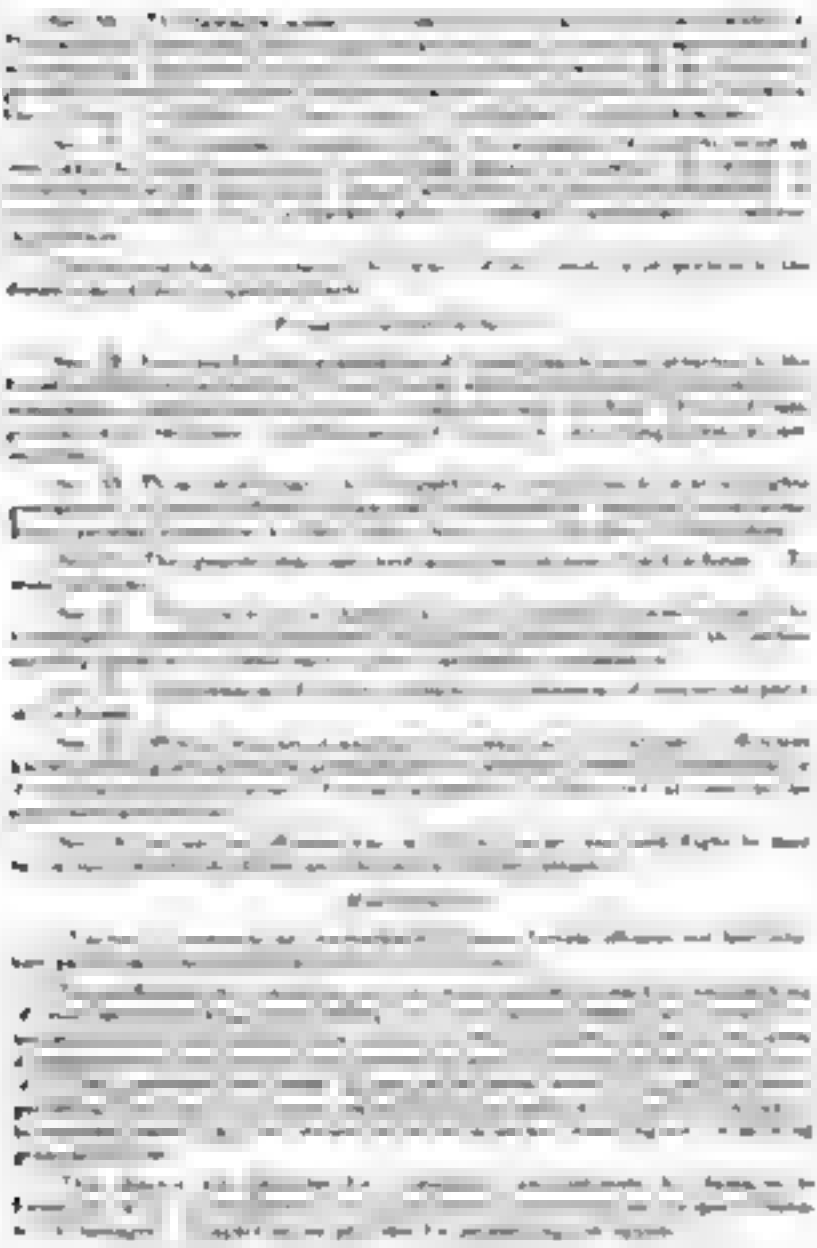
[illegible]

[illegible]

[illegible]







[illegible]

Forest Area in the Prussian Monarchy

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible] the same heads the 8 circuit Provinces and the district of Cologne have the following area respectively —

[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

possible way. It is, therefore, the duty of the *oberförster* to possess the most exact knowledge of the working of the districts confided to his care, and not to neglect visiting the forest daily if possible.

The *oberförster* is an independent officer, and is alone responsible for the duties and salaries of his assistants.

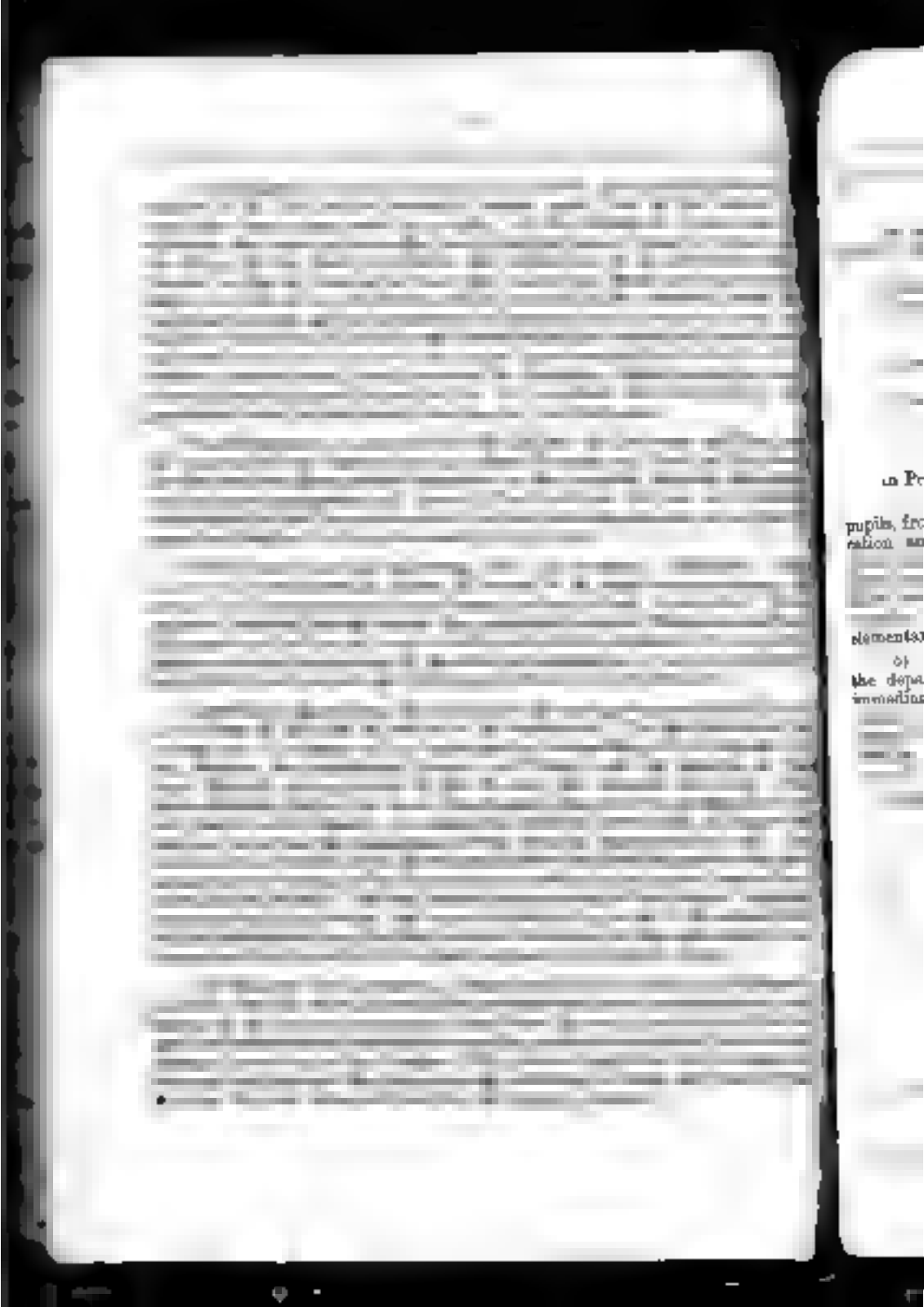
The *oberförster* on having passed the scientific examination required by the State is appointed by the Minister of Agriculture, Domain, and Forest, and receives a definite salary with the right of pension. His rank is that of a government assessor. The extent of each forest district varies. There are 679 forest districts in Prussia, and the average size of each district is 3,496 hectares.

The following table shows the area of State forests in the different Provinces, also the number and the average size of each *oberförsterei*.

Province.	Forest area.	Oberförstereien.	Average size of oberförsterei.
	Hectares.	Number.	Hectares.
East Prussia	660,943	74	4,666
West Prussia	273,174	47	5,810
Brandenburg	383,510	72	5,132
Pomerania	174,612	42	4,038
Posen	139,020	28	5,787
Silesia	181,320	34	5,451
Saxony	109,490	33	3,031
Schleswig	20,117	8	4,388
Hanover	329,074	104	3,980
Westphalia	87,139	19	5,006
Hesse-Nassau	263,008	145	4,338
Other Provinces	148,364	43	3,413
Total	2,374,060	679	45,476

There is a treasurer for each *oberförsterei*. He is an independent officer and is alone responsible for the administration of his domain. The government appoints him and he is required to give bond for the faithful discharge of his duties.

The foresters under the supervision of the chief forester (*oberförster*), are of two classes, namely those who protect and attend to the practical management of the forests, the so-called *försters* (foresters), and *waldwärter* (forest accountants), and the assistant foresters, the so-called *forstlehrlinge* (forest learners). The immediate head of the chief forester is the director of the government especially in department of finance, and whose organs are the administration and supervision of the forests and the finances are in the person of the *forstmeister* (forest master), and *oberforstmeister* (head forest master). The former has control over a certain number of the chief forests within the government district and the latter over all in the government district.



[illegible] GOVERNMENT FORESTS. [illegible] OF MAINTAINING [illegible] PLANTS [illegible] OF [illegible]

The estimated revenue and expenditure of the State forests for the years [illegible]-37 according to [illegible] statement are given as follows:

Gross receipts	M	[illegible]
Ordinary expenses	M	[illegible]
Surplus	M	[illegible]
Extraordinary expenses		[illegible]
Net income	M	23,537,800

Forest Schools

In Prussia there exist three kinds of forest schools.

a. Two preparatory forest schools for [illegible] and [illegible]. The pupils from [illegible] years of age receive at these schools an elementary education and practical instruction in forestry under the direction of a forester. These schools are intended to take the place of the apprenticeship of two or three years which the student in the neighborhood of his elementary education elsewhere would otherwise be obliged to serve at all the various upper branches of the forest. The advantage of the former is that it combines the elementary education with practical forest instruction.

b. Two forest academies, one at Abernode and the other at Minden, under the department of the Minister for Agriculture, Domain and Forest, and his immediate supervision of the forestry [illegible] one of the state forest officials in the Forest Department of the Ministry. These academies are intended to give a scientific education and to be a preparation for the Forest administration service, that is to say for the higher forest career from the forester upwards.

The term of study is two years and embraces the following branches:

A. Fundamental Sciences

1. Physics, including meteorology and mechanics.
2. Chemistry, organic and inorganic.
3. Mineralogy.
4. Geography and geology.
5. Botany.
   a. General botany.
   b. Anatomy, physiology and pathology of plants.
   c. Special forest botany.
   d. Examinations and macroscopic demonstration.
6. Zoology.
   a. General zoology.
   b. Special zoology particularly with respect to the different kinds of forest animals and birds.

7 Mathematics

a Repetore and practice in arithmetic, planimetry, trigonometry and stereometry

(b) Principles of analytical geometry

(c) Principles of high analyses.

8 General political economy particularly with respect to forest affairs

B Branch Science

History and literature of forest affairs

2 Forest statics.

3. Forest planting.

4 Forest protection

5 Forest technology

6 Forest valuation, wood measuring, forest survey

7 Forest statistics

8. Forest administration particularly with respect to the organization of forest affairs in Prussia.

9 Forest administration.

10. Redemptions of forest claims.

C Auxiliary Science

1 Jurisprudence. Prussian civil and penal code

2 Forest road construction.

3. Game law

As aids to study these academies have extensive collections relating to forest and nature science botanical gardens, and excursions etc Each academy is under the direction of an *Oberforstmeister* The lectures are given by scientifically educated foresters and special professors. The student before he is admitte to these academies must produce a diploma showing that he has passed the course of studies required at a German gymnasium or at a Prussian technical school of the first class. He must be under 25 years of age have a good character and show that he possesses the necessary means for studying

EFFECTS OF FOREST DESTRUCTION

The destruction of forests is caused mostly by parceling off large forest estates which leads to a careless felling of the trees and a disposition to restore the loss. An eminent authority on forestry science, Dr Otto von Hagen, in writing on this subject makes the following observations

The forest is a social institution known to us from very ages whose value consists not alone in the income derived from wood but also in the importance which it exerts through its influence on climate and rainfall on land cultivation its importance is not merely a question of the present day or of the present ownership, but is also a matter which concerns the future welfare of the people. This is a truism beyond contradiction, but nevertheless it is often disregarded by those who are indolent and selfish

the demand for wood, and the rise in the price

one followed suit and later Fre

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matter was taken in hand
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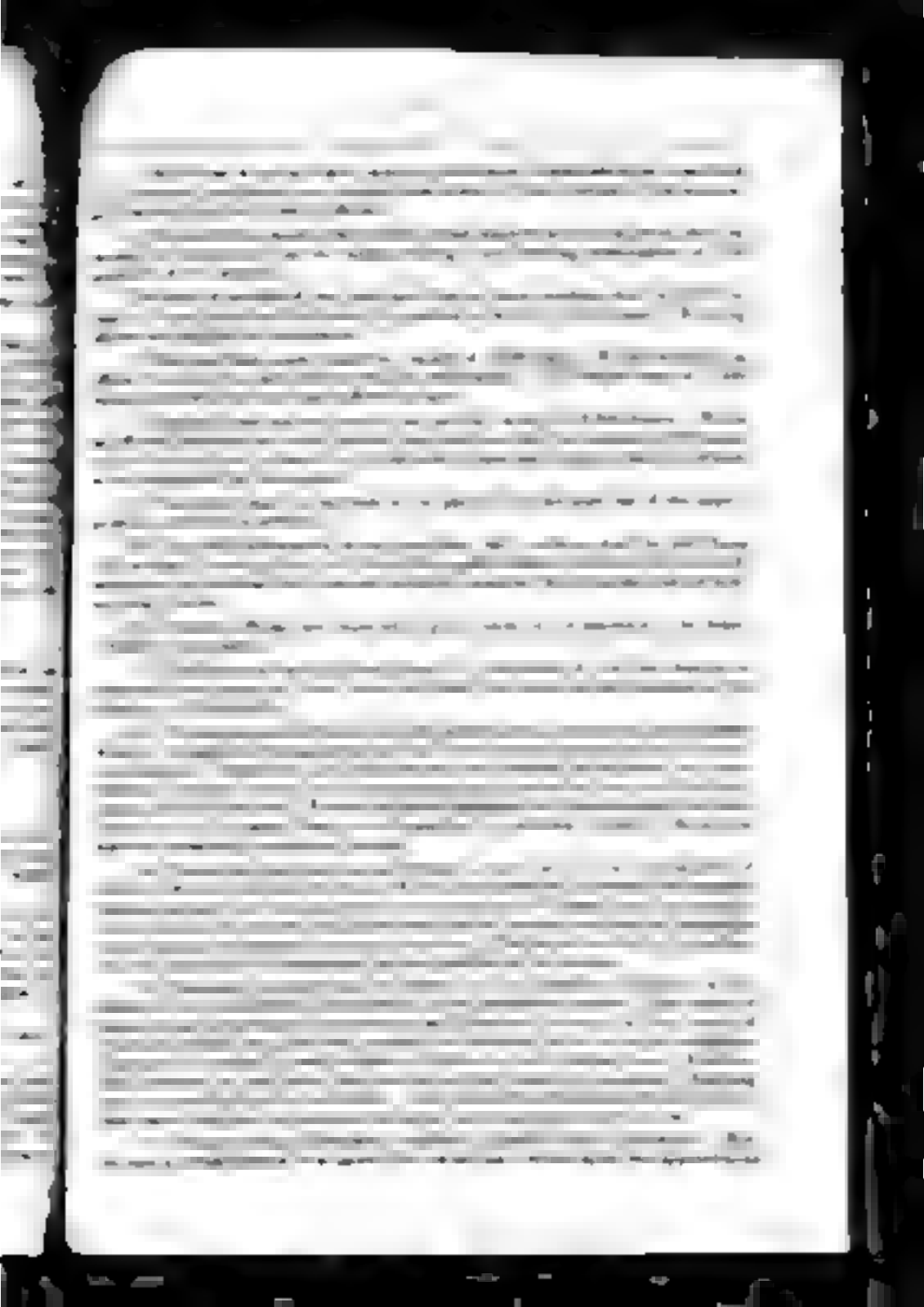
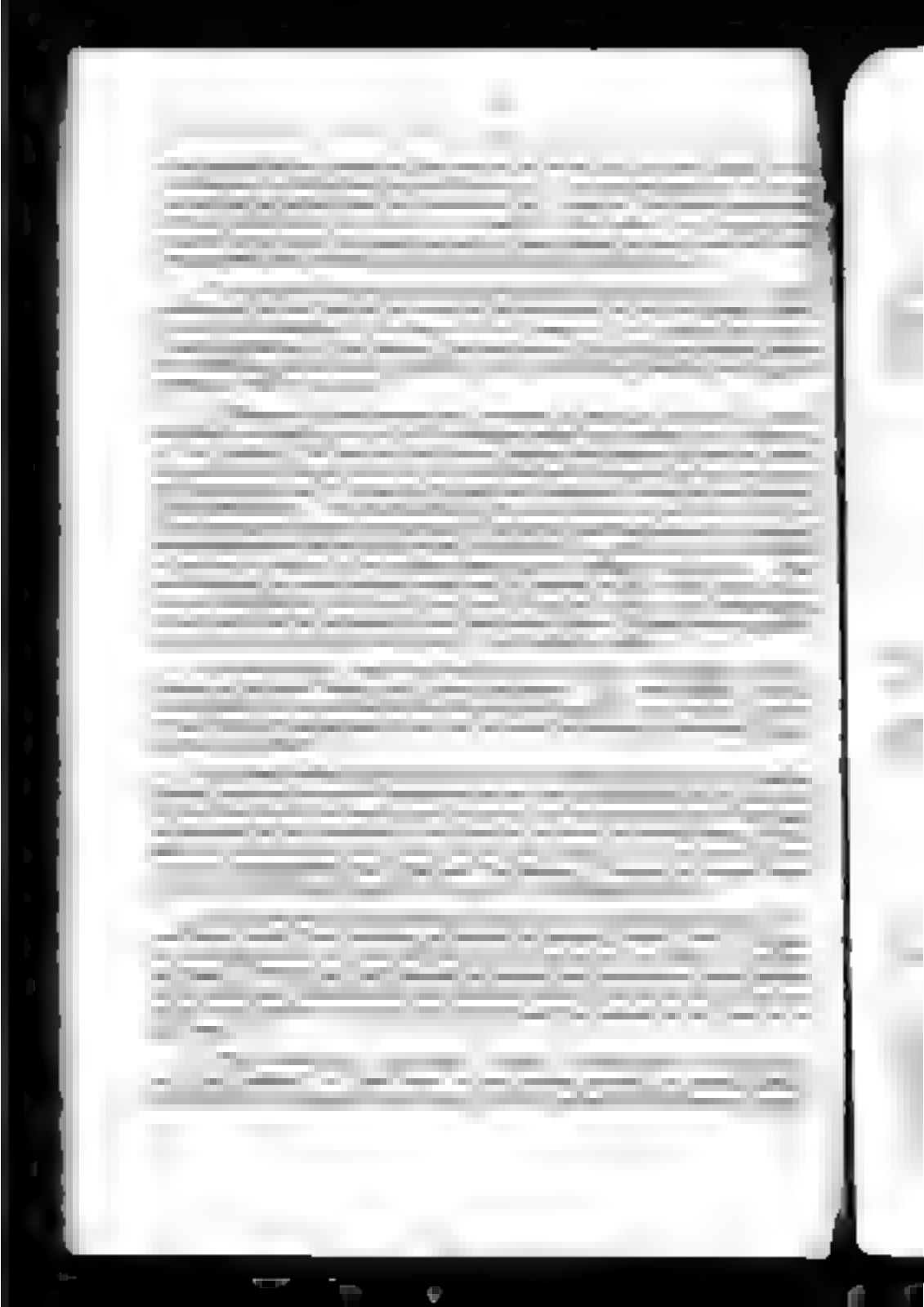
perforat master and





FORESTRY [illegible] FRANCE*

THE [illegible] FORESTS OF FRANCE

[illegible] complete [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] devoted [illegible] [illegible] [illegible] country. The proportion [illegible] European [illegible]

	Per cent.
Russia	[illegible]
[illegible]	[illegible]
Norway	[illegible]
[illegible]	26
[illegible]	13
Switzerland	[illegible]
[illegible]	[illegible]
[illegible] and Holland each	
[illegible]	5
The British Isles	4
Denmark	4½

The [illegible] European States taken together [illegible] per cent. The [illegible] of France [illegible] that the area [illegible]

Some changes which will be noted in a subsequent chapter have taken [illegible] in the area of the State forests since [illegible] the following proportions [illegible] proprietors [illegible]

	Square miles	Per cent.
The State	[illegible]	[illegible]
[illegible] communes	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible] proprietors	[illegible]	[illegible]
Total	[illegible]	[illegible]

[illegible] these figures may be taken as fairly representing the actual [illegible] the present time.

[illegible] agricultural [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] that would be quite [illegible] of [illegible] a series of

*By [illegible] Transactions of the [illegible]

It is seen that if the [illegible] be grouped together so as to form a series of pure forests the [illegible] area which would be occupied by each species would be as follows:

	Per cent
Oak (Q. [illegible] and Q. [illegible])	29
[illegible]	8
H[illegible]	2
[illegible]	7
Scotch pine [illegible]	4½
Evergreen oak (Q. ilex)	6
M[illegible] pine	3
Sp[illegible]	3
[illegible]	8
[illegible]	18½
Total	100

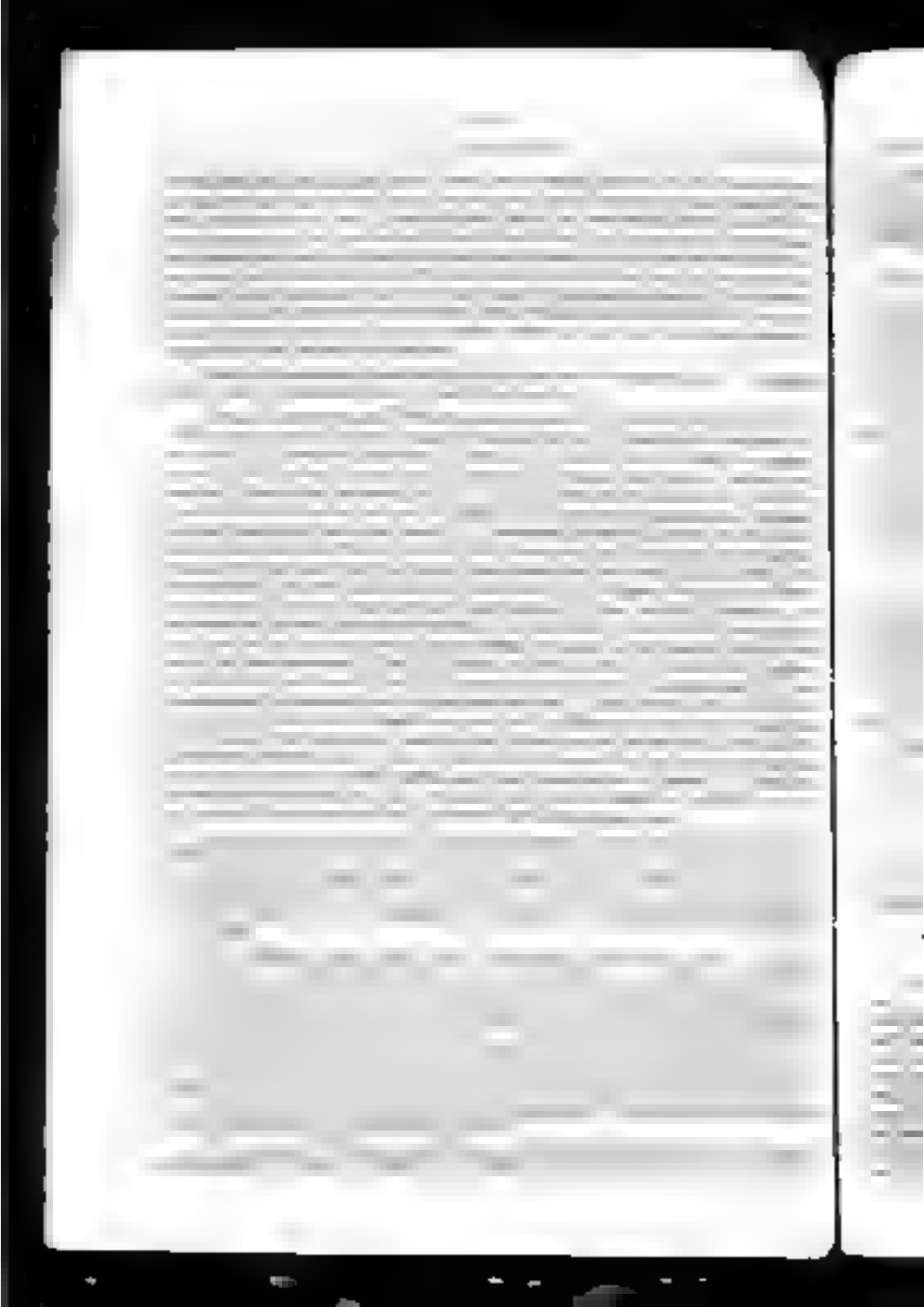
The small number of species [illegible] [illegible]

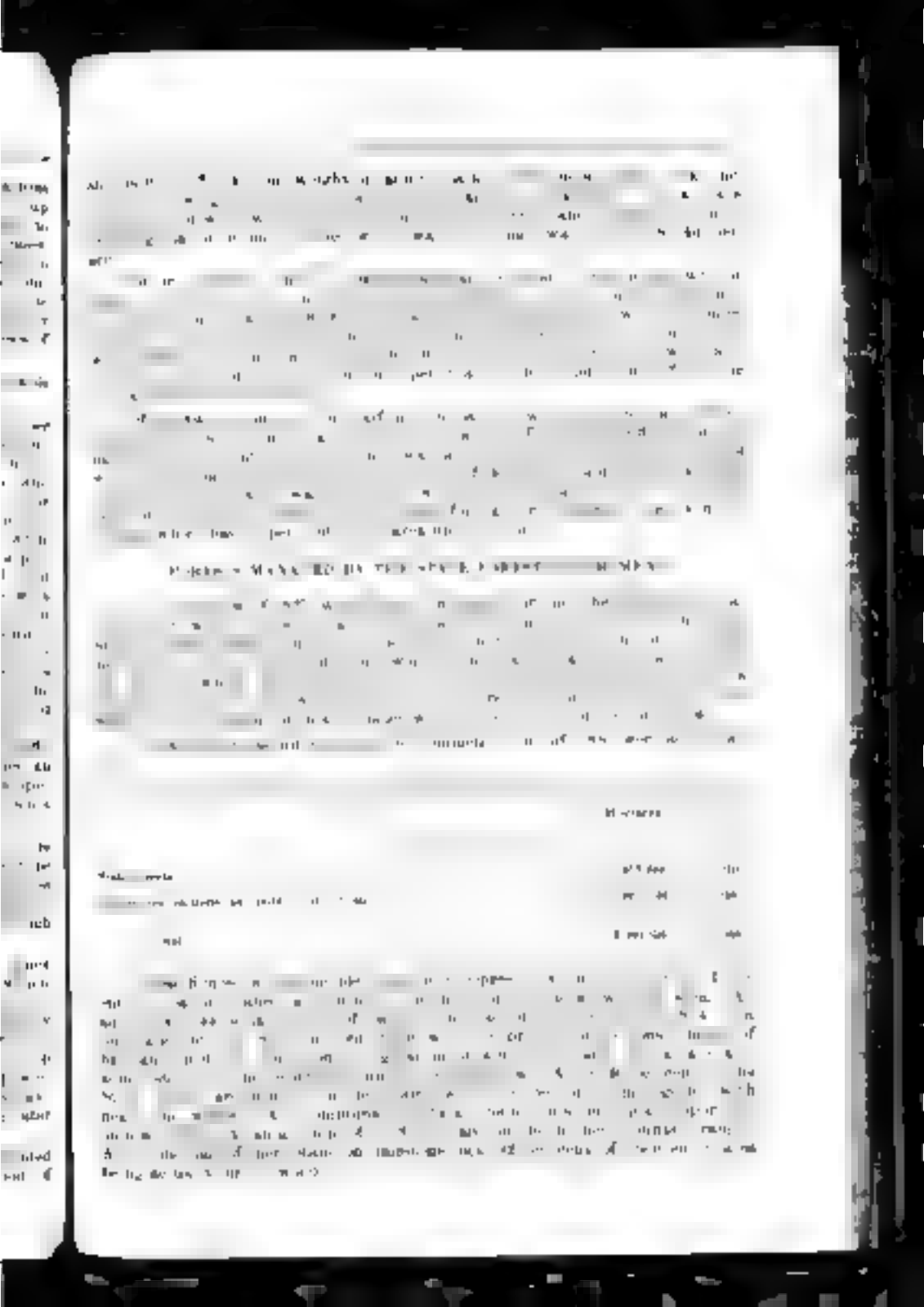
	Per cent	
Pure forests		
Broad-leaved [illegible] oak or beech		
Coniferous [illegible] pine, spruce [illegible] larch	3	
		2[illegible]
Mixed forests		
Broad-leaved [illegible] oak, beech, and [illegible]	58	
Broad-leaved and coniferous [illegible] fir or [illegible] pine	8	
Coniferous [illegible] fir and spruce	2	
		7[illegible]
Total		100

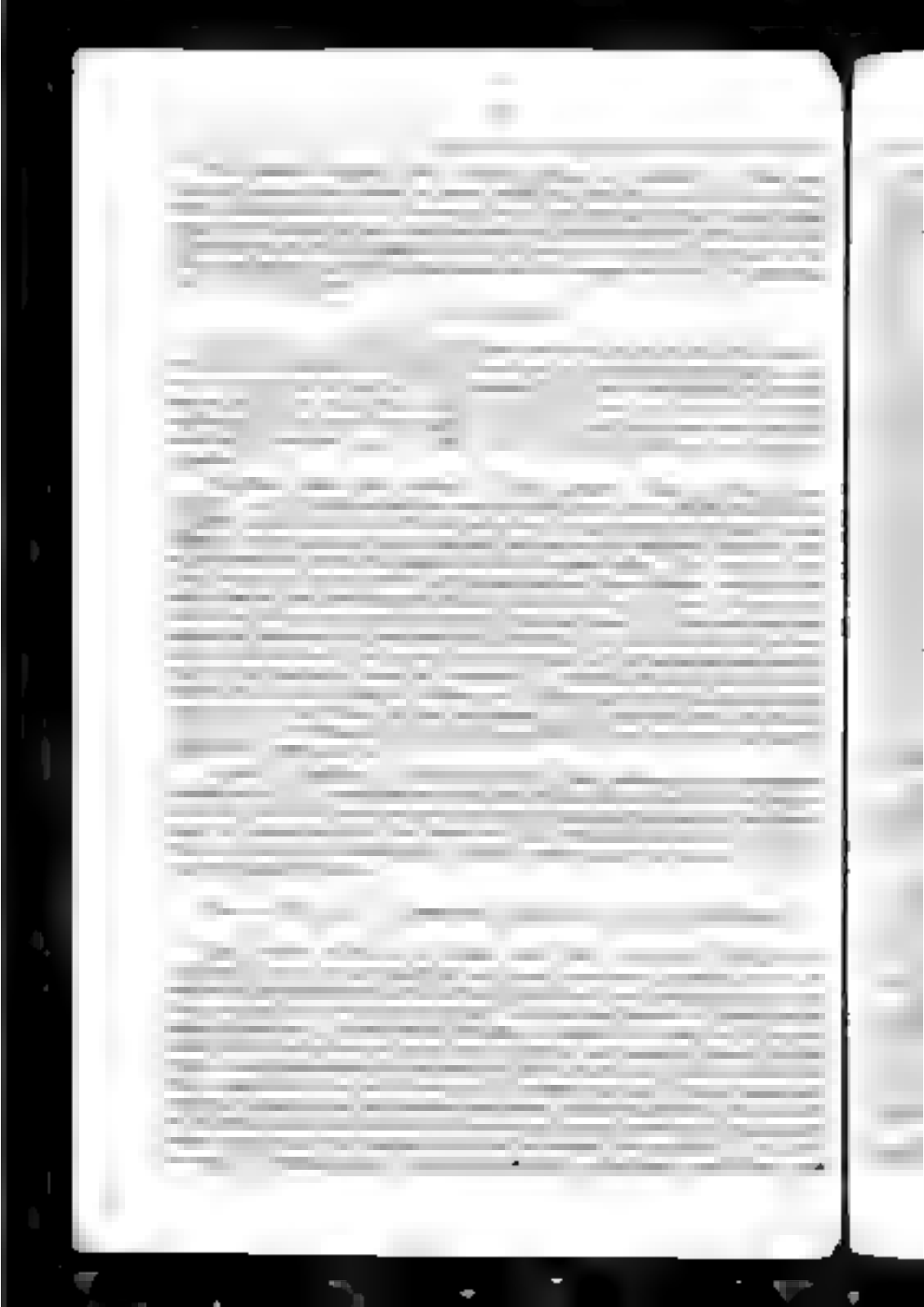
[illegible] the broad-leaved and the coniferous forests from those which [illegible] [illegible]

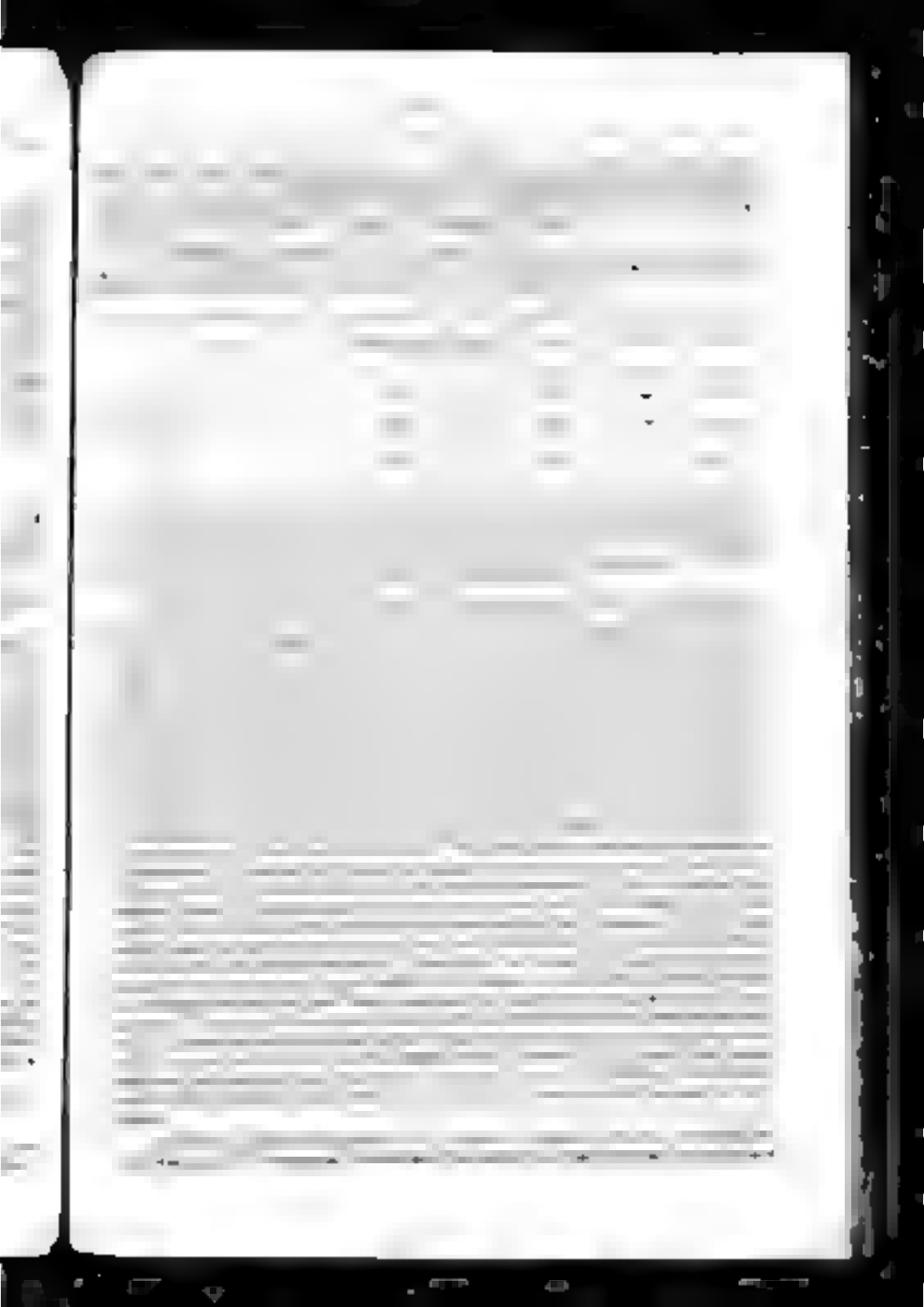
	Per cent
Broad-leaved forests (pure and mixed)	[illegible]
[illegible] forest [illegible]	[illegible]
Broad-leaved and coniferous [illegible]	[illegible]

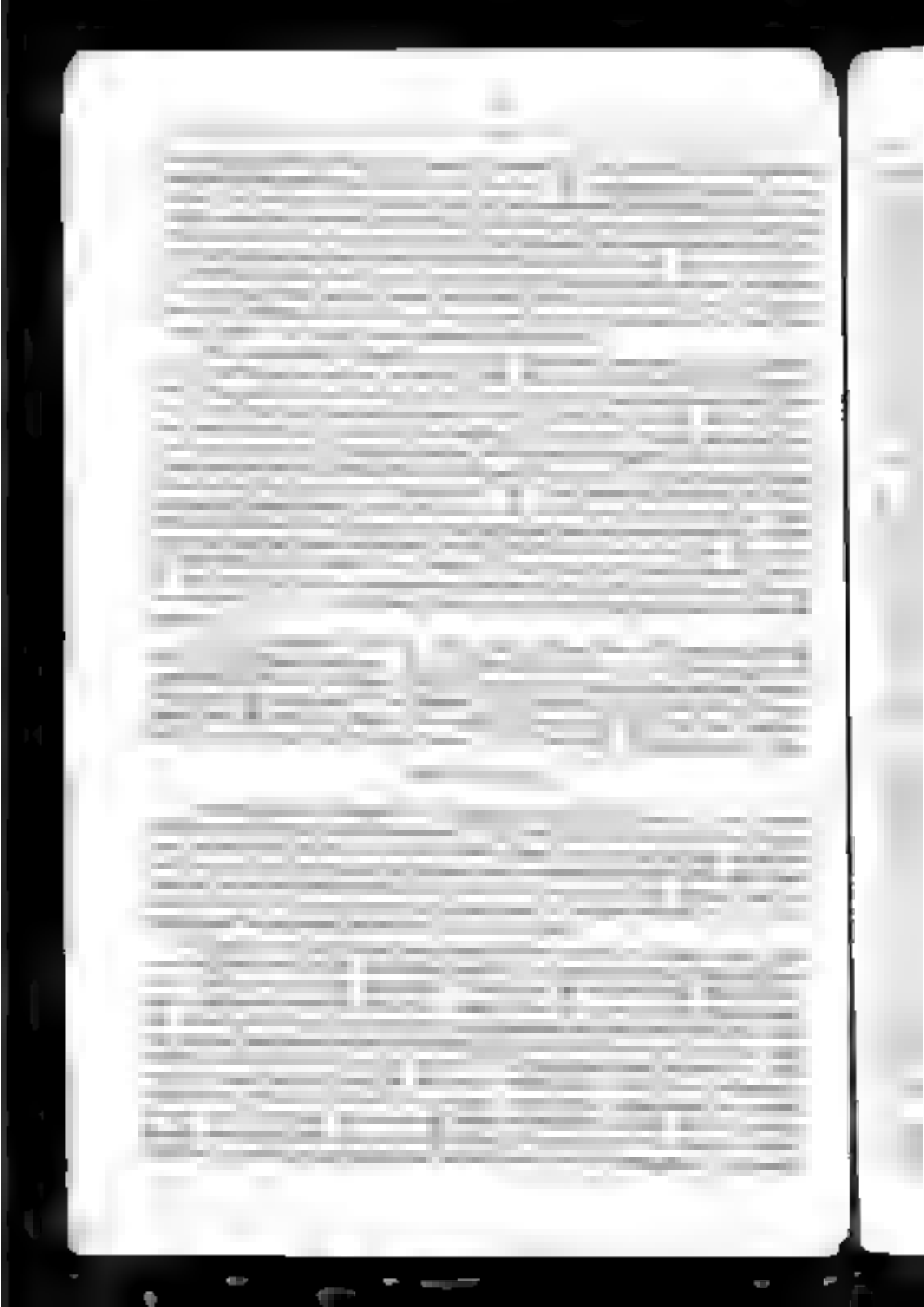
The State forests show a smaller proportion of pure stands than are found in [illegible] [illegible] been the case in the [illegible]. This [illegible] difference is clearly accounted for

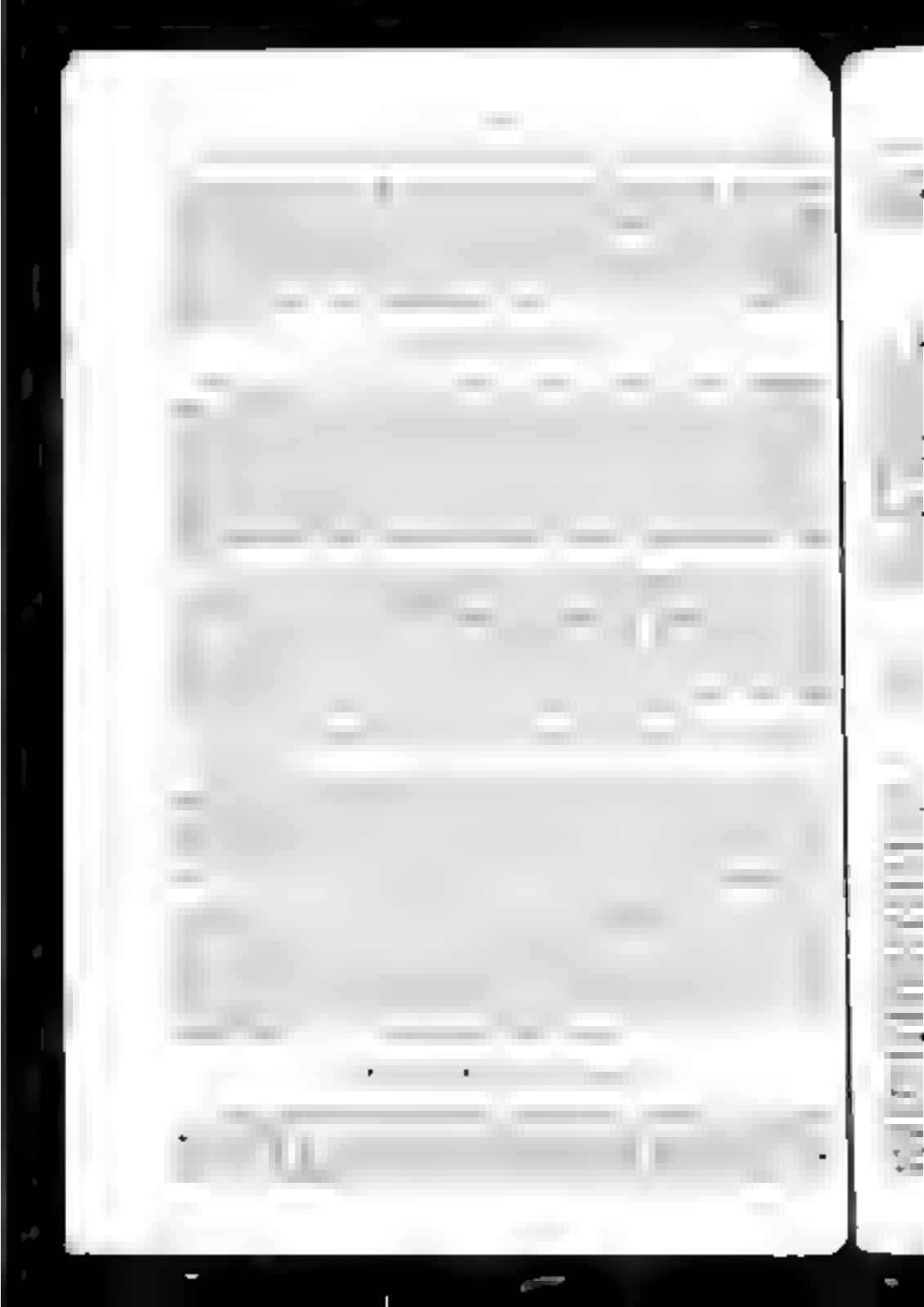












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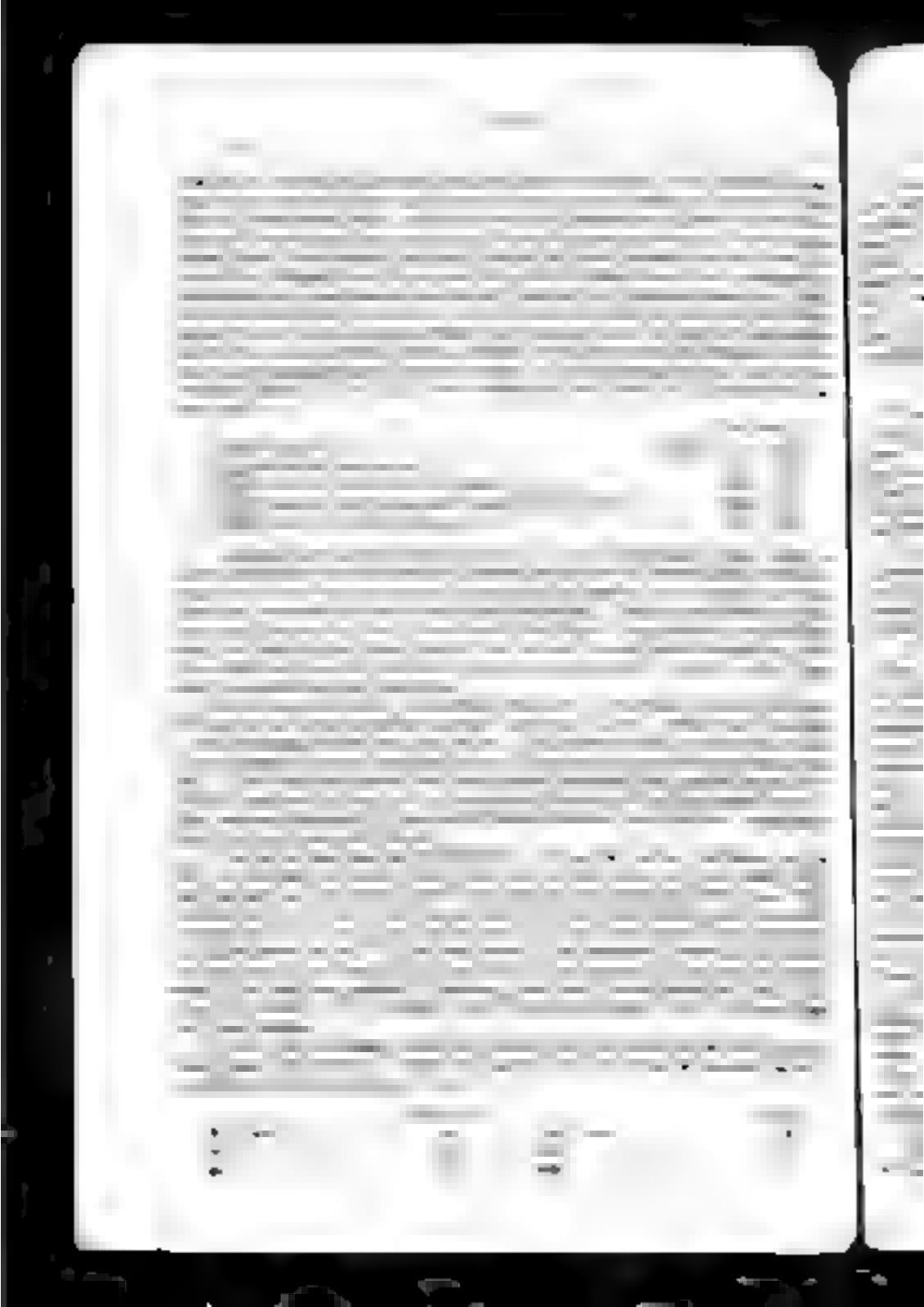

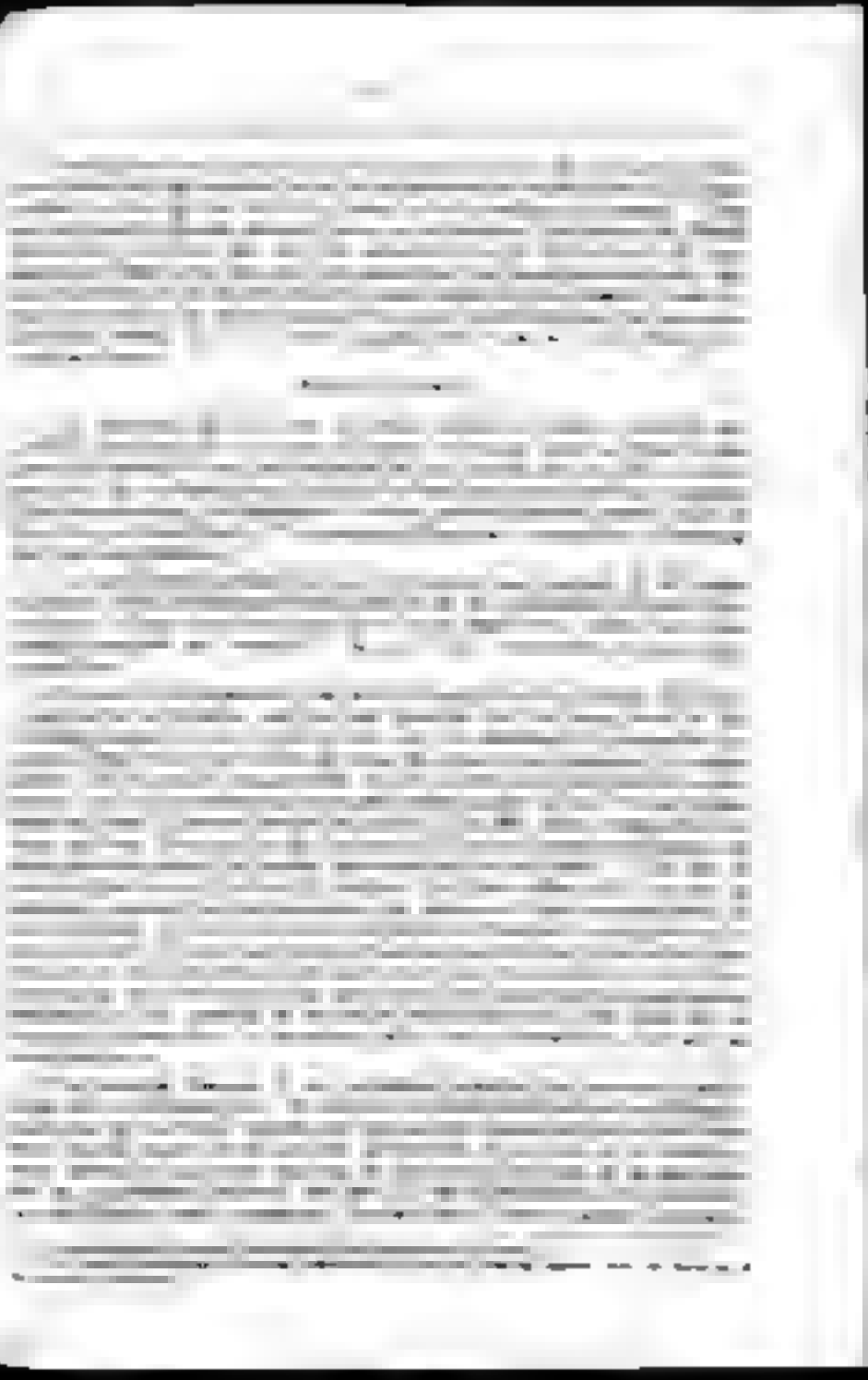

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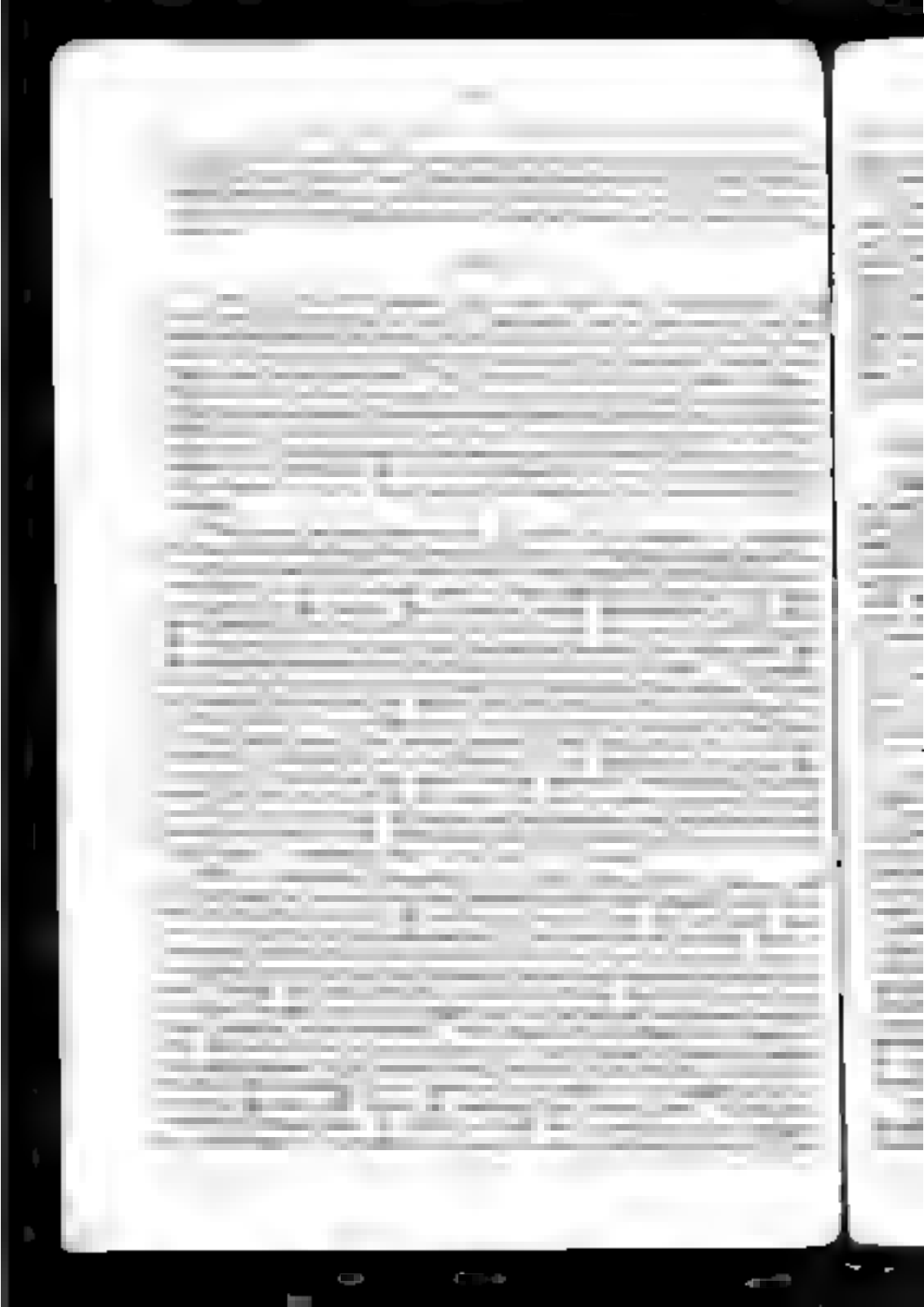

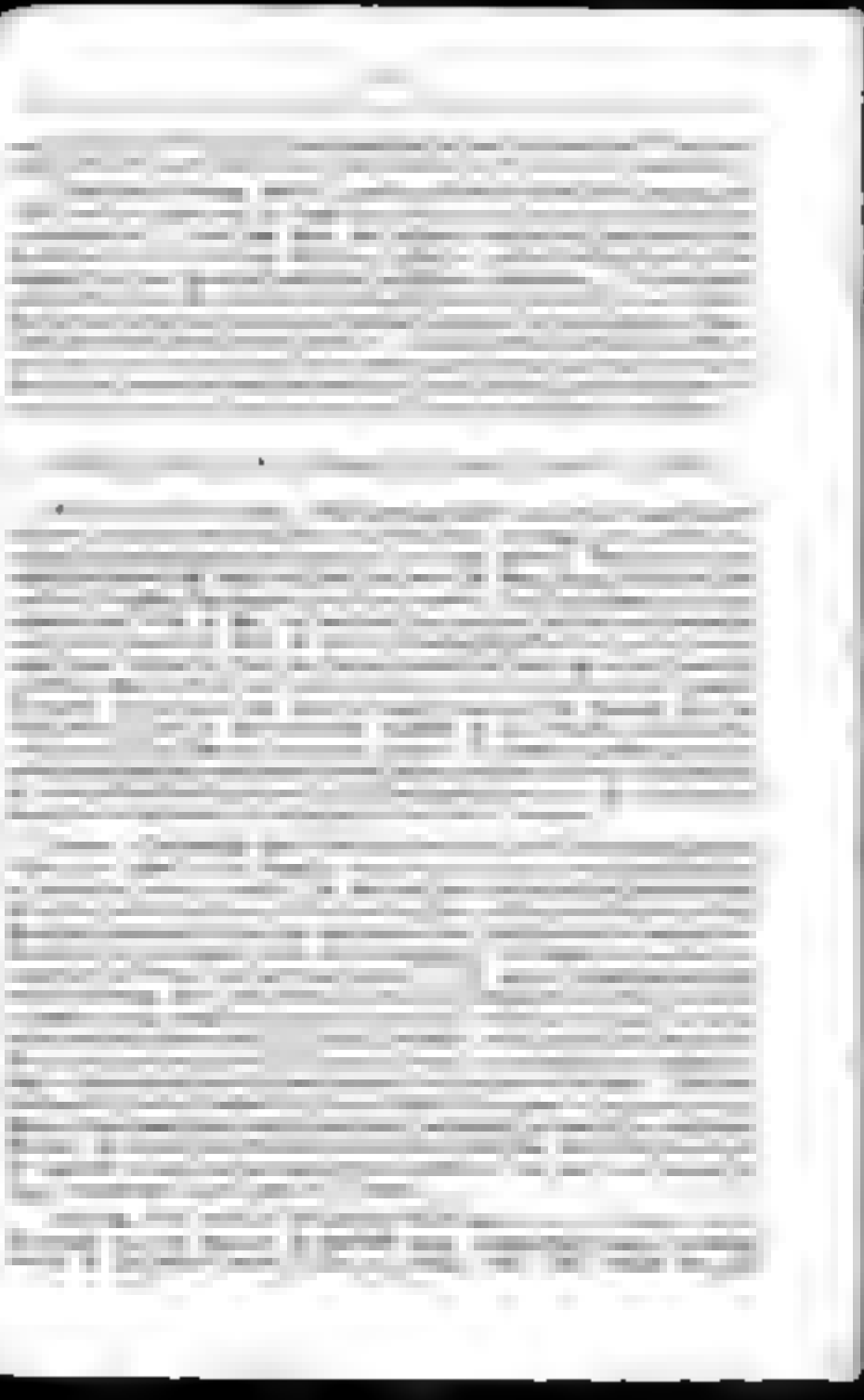

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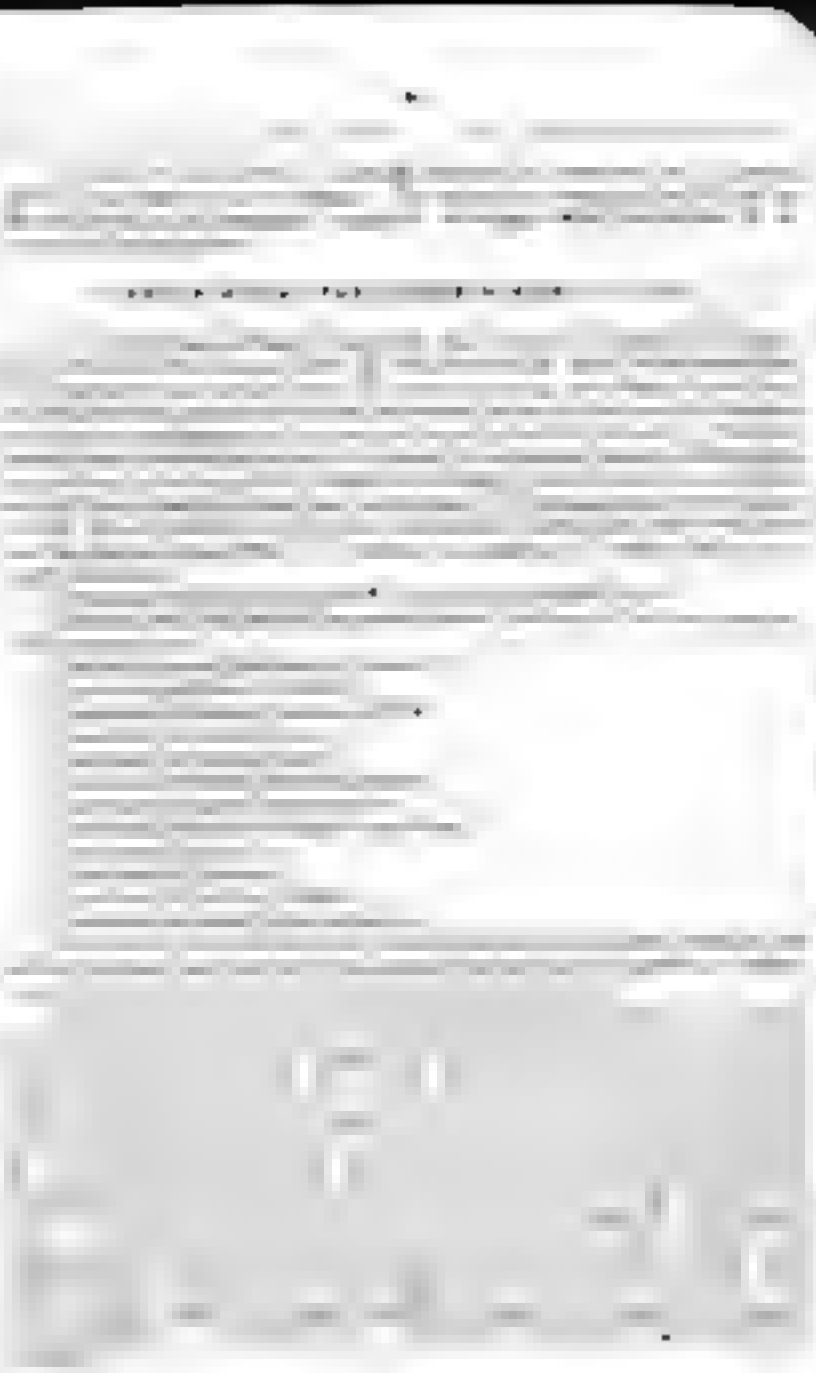

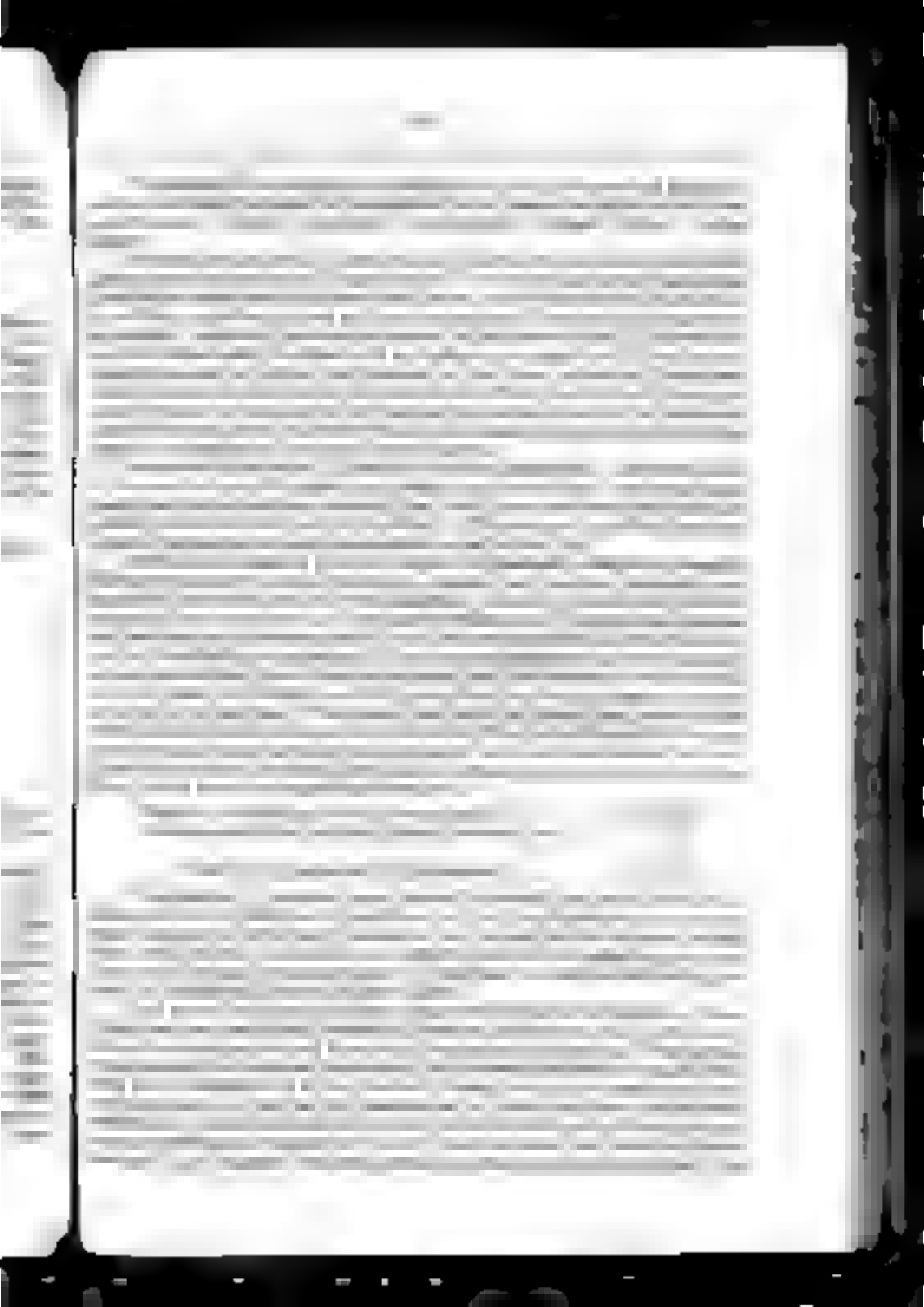

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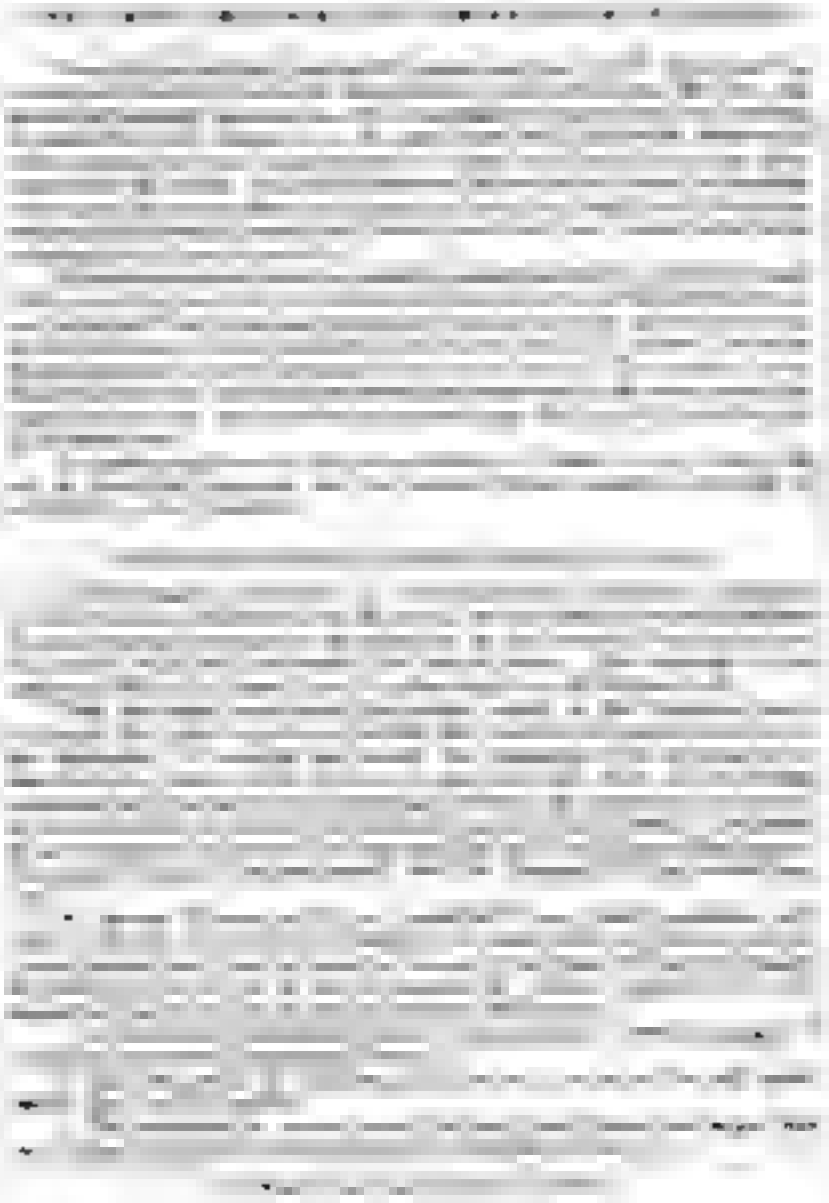
permitted to render assistance in his manner but they frequently attempt to imitate what is being done in the State forests without knowing the reasons for what they see and they are thus led to commit serious mistakes as, for example when, in treating a forest which is to be permanently maintained as coppice under standards, they follow the procedure adopted in a neighboring State forest which is undergoing conversion into high forest In many cases, of course the private woods are too distant from the State or communal forests to permit of their owners obtaining any advice or assistance from the officials of the forest department and they are then thrown entirely on their own resources



The [illegible] is to show the proportion of [illegible] made in recent years [illegible]

[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
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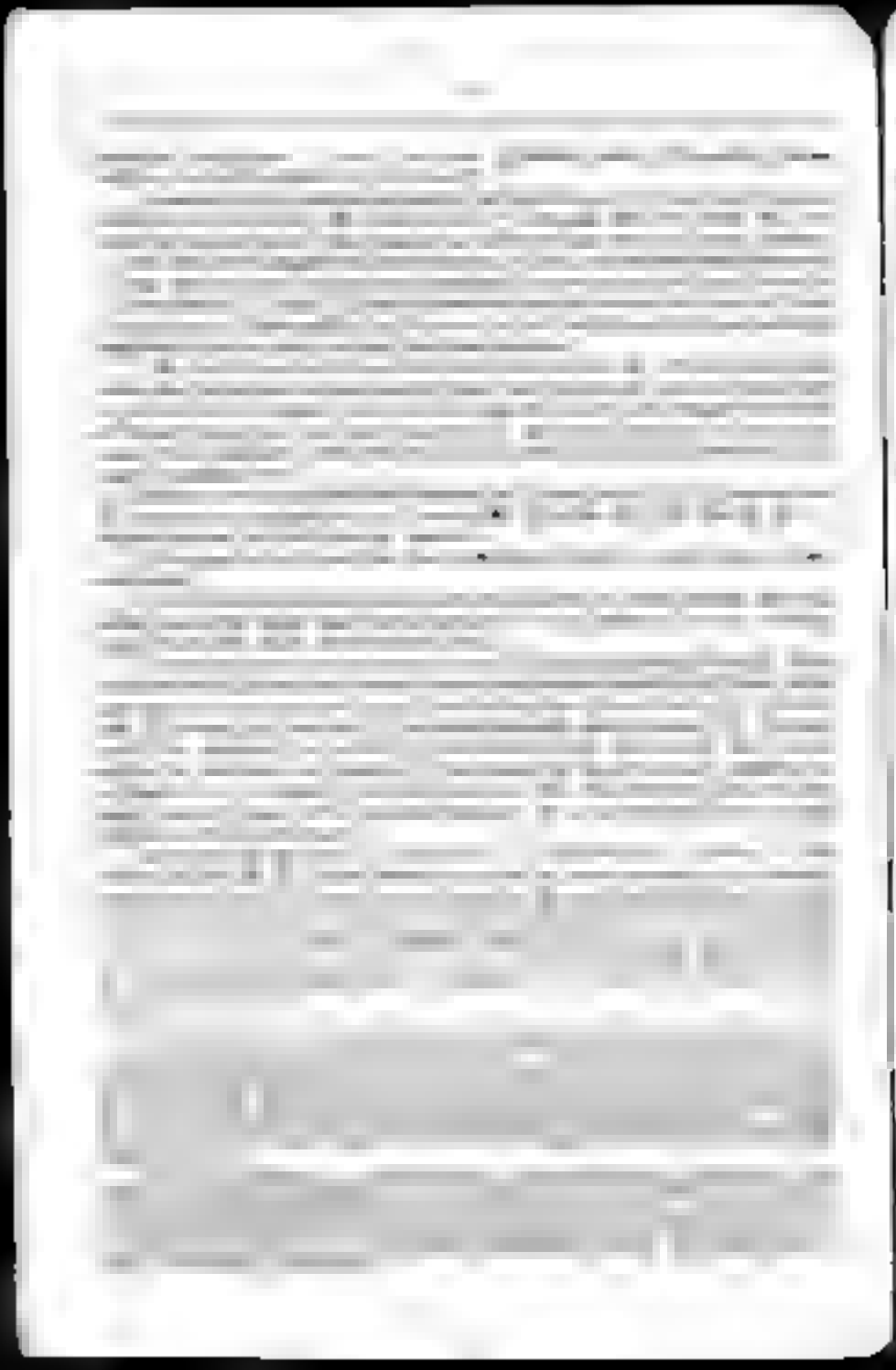

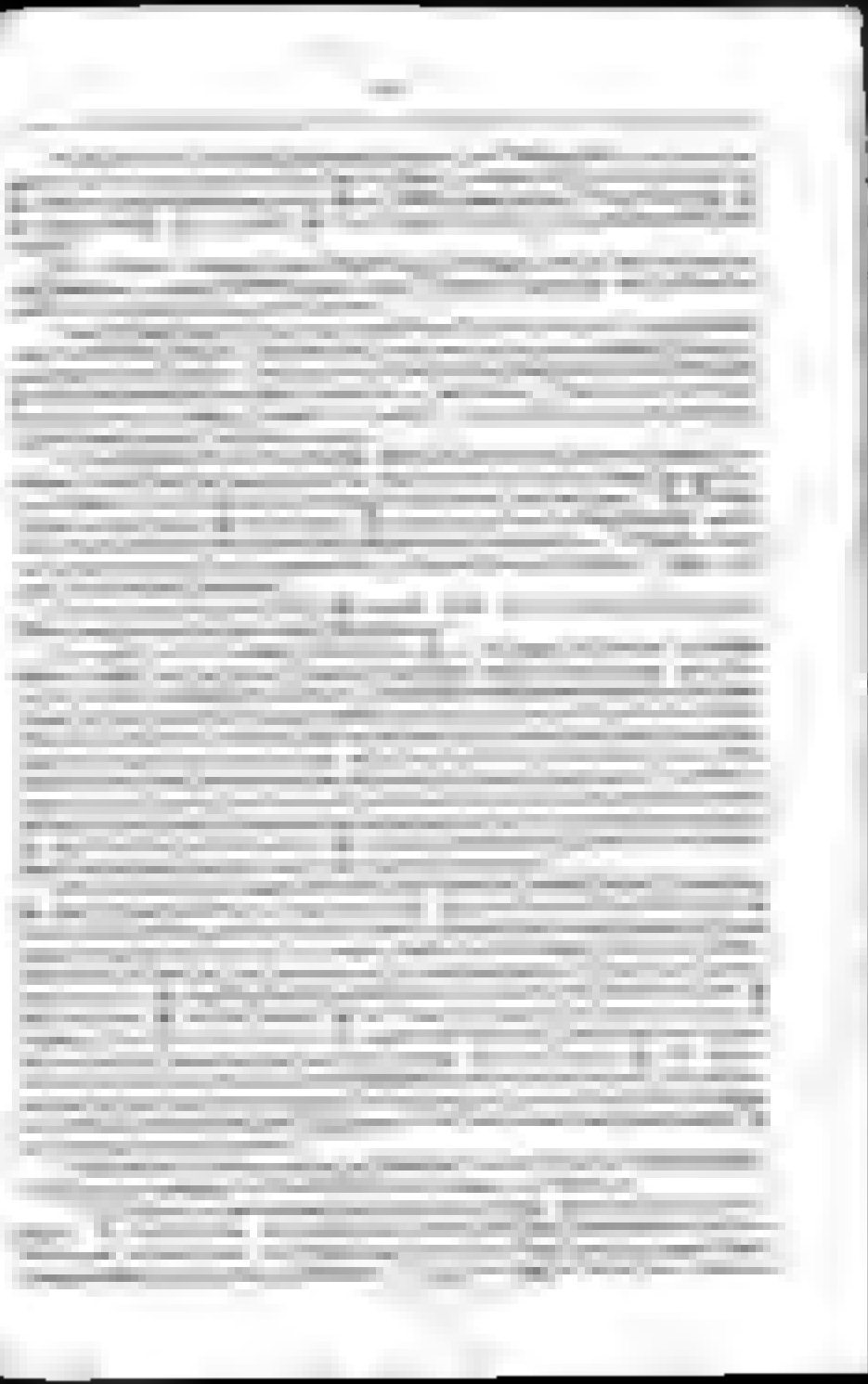

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Comparison of the Several Classes of Forest Products Exported from the Provinces of Canada During the Twelve Years Preceding the Formation of the Dominion Government

Quantities and Values

Years.	Ash.		Birch		Elm		Maple.	
	Tons.	Value.	Tons.	Value.	Tons.	Value.	Tons.	Value.
1858	3,589	$19,423	1,264	$12,389	58,455	$620,232	18	$180
1859	3,490	22,320	1,826	16,896	37,564	435,628	162	1,328
1860	2,378	15,589	4,088	38,334	19,401	183,380	37	333
1861	4,813	25,087	557	5,294	21,279	203,840	81	738
1862	3,471	4,976	10,441	100,106	35,439	387,837	349	1,996
1863	2,452	3,708	4,257	40,840	25,510	258,962	97	864
1864	2,409	13,470	4,651	32,491	27,792	209,813	186	893
1865	3,241	42,225	6,586	59	53,252	431,180	440	2,420
1866*	1,814	8,437	3,913	36,415	1,531	21,414	81	893
1866†	3,810	22,699	10,498	82,638	49,645	387,833	10	200
1867*	2,620	30,856	1,743	12,005	29,455	255,870	52	265
1867†	3,691	25,074	9,894	81,540	34,470	284,847	58	640

* Half year ending June 30. † Year ending June 30 Since 1868.

Years.	Oak.		White pine.		Red pine.		Tamarack.	
	Tons.	Value.	Tons.	Value.	Tons.	Value.	Tons.	Value.
1858	48,814	$37,139	257,048	$3,060,865	41,848	$431,891	2,137	$13,281
1859	46,586	374,630	200,781	2,881,980	31,855	326,456	4,077	29,437
1860	36,904	277,681	344,891	4,871,840	53,143	624,978	286	2,414
1861	34,200	259,731	285,884	4,284,009	53,019	525,567	2,185	11,892
1862	41,452	401,861	460,256	5,352,695	61,072	567,210	2,562	12,532
1863	51,878	398,287	525,712	5,584,338	71,311	620,952	1,851	7,119
1864	47,456	337,34	431,387	5,110,016	77,573	454,218	14,361	89,301
1865	73,227	753,338	466,833	5,306,804	110,824	748,842	19,893	134,953
1866*	26,327	206,849	194,882	918,888	32,923	220,853	5,396	34,984
1866†	113,913	1,069,417	808,300	9,843,384	106,877	781,037	10,681	69,392
1867*	44,898	710,071	450,850	5,134,663	83,681	606,184	1,305	7,338
1867†	43,886	626,481	413,098	4, 16,384	74,798	499,894	6,447	36,016

* Half year ending June 30. † Year ending June 30 Since 1868.

EXPORTS TO GREAT BRITAIN.*

The timber trade of British North America is principally concentrated along the Provinces of Nova Scotia and New Brunswick, and throughout the St. Lawrence and Ottawa Rivers, and [illegible] western Ontario.

Up to about the year 1842 and for some time afterwards a very much lower duty was levied in Great Britain on wood which was the produce of Canada than on [illegible] from European nations. This led to the [illegible] of a very large trade [illegible] the St. Lawrence [illegible] region which forty or fifty years ago was looked upon as Great Britain's principal source of supply of large quantities of white pine and spruce, as well as a small supply of red pine [illegible] partly sawn [illegible] in a sawn condition. A [illegible] exports.

The following [illegible] of the Quebec export trade for the nine years ending with 1882:

In 1874	[illegible] timber carrying vessels of	[illegible] tons cleared out.
1875	[illegible]	[illegible]
1876	780	[illegible]
1877	[illegible]	[illegible]
1878	[illegible]	[illegible]
1879	[illegible]	[illegible]
1880	634	[illegible]
1881	[illegible]	[illegible]
1882	426	[illegible]

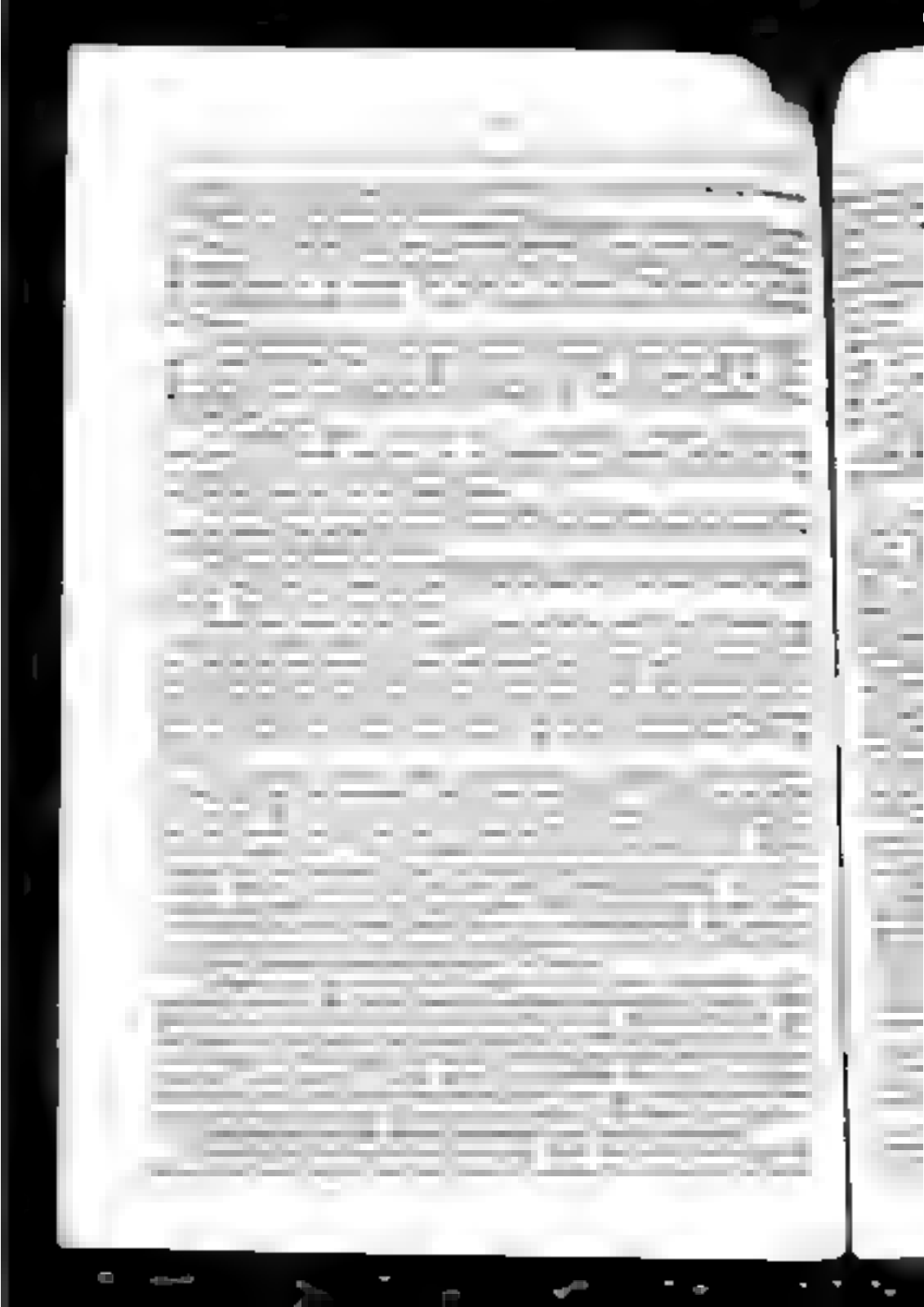
[illegible] vessels [illegible] are chartered [illegible] from Quebec and [illegible] large [illegible] in [illegible] the fact that [illegible] export [illegible] of Quebec [illegible].

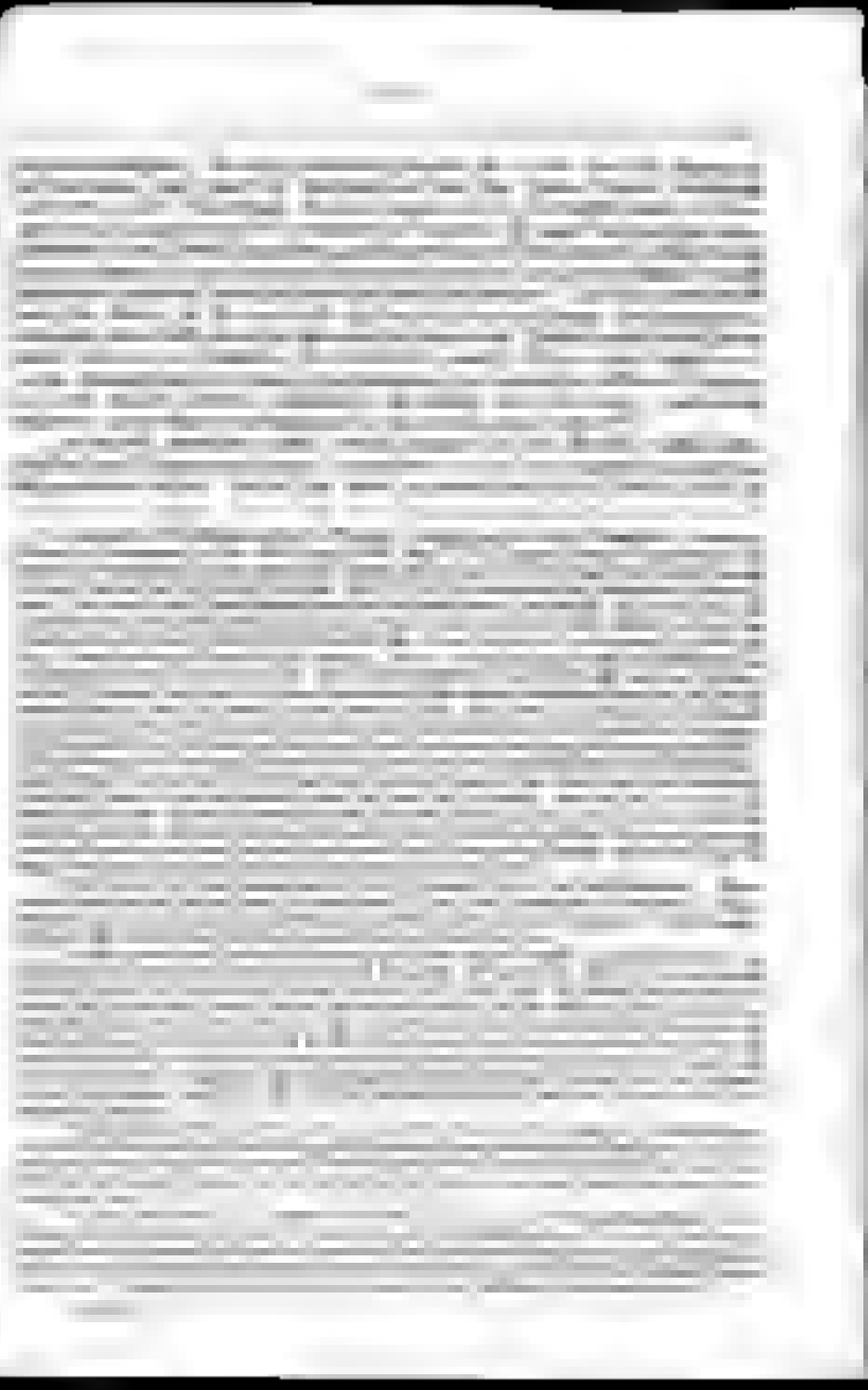
The following [illegible] statement [illegible] of which that export was composed for the five years mentioned [illegible].

	1878	1879	1880	1881	1882
Square timber:					
Square and waney pine	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Red pine	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Oak	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Elm	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Birch	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Sawn wood:					
Pine deals	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Spruce deals	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

There are no means of ascertaining the exact amount of the Quebec shipments to the United Kingdom, but [illegible] about five [illegible] of the whole quantity [illegible] despatched over sea. The total exports of Quebec [illegible] Europe

*[illegible], Edinburgh, [illegible].





the [illegible] and spontaneous manner in which the [illegible] [illegible]. [illegible] which [illegible] spruce [illegible] inches and upwards in diameter have been taken, will after a rest of [illegible] decades [illegible] work again.

[illegible] attempt has been made by the [illegible] of mature spruce now growing in New Brunswick [illegible] between [illegible] according to Mr. [illegible], late Premier of the Province of Quebec, [illegible] immense quantities of spruce.

The following table [illegible] the total number of [illegible] of squared white [illegible] and red pine [illegible] Quebec and [illegible] lands from [illegible] as nearly as can be learned from the records of the [illegible] Timber Office, Ottawa.

From 1826 to 1866 [illegible]

	Square timber		Pine saw logs (cubic)	
	Ontario	Quebec	Ontario	Quebec
White pine	[illegible]	[illegible]	[illegible]	[illegible]
Red pine	[illegible]	[illegible]		
Other wood	[illegible]	[illegible]		
Totals	[illegible]	[illegible]	[illegible]	[illegible]
Deduct [illegible] lands	[illegible]	[illegible]	[illegible]	[illegible]
[illegible] lands	[illegible]	[illegible]	[illegible]	[illegible]

"The [illegible] reference [illegible] chapter in the [illegible] of Michigan [illegible] Southern Pro[illegible] developed [illegible] Mississippi [illegible] Mississippi.

[illegible] probably take [illegible] duration.

[illegible] Russell, Crown Timber Agent, [illegible] in Reports on the Forests of Canada [illegible]

From 1867 to 1881 Inclusive

	Square timber.		Pine saw-logs (only)	
	Ontario	Quebec	Ontario	Quebec
White pine	1,438,547	1,131,882	17,280,860	17,327,109
Red pine	830,141	715,596		
Other wood	283,376	85,519		
Totals	2,542,064	932,997	17,280,860	17,327,109
Deduct from private lands	615,471	344,698	1,330,270	2,038,413
Crown timber	1,926,593	1,006,439	15,950,590	15,288,696

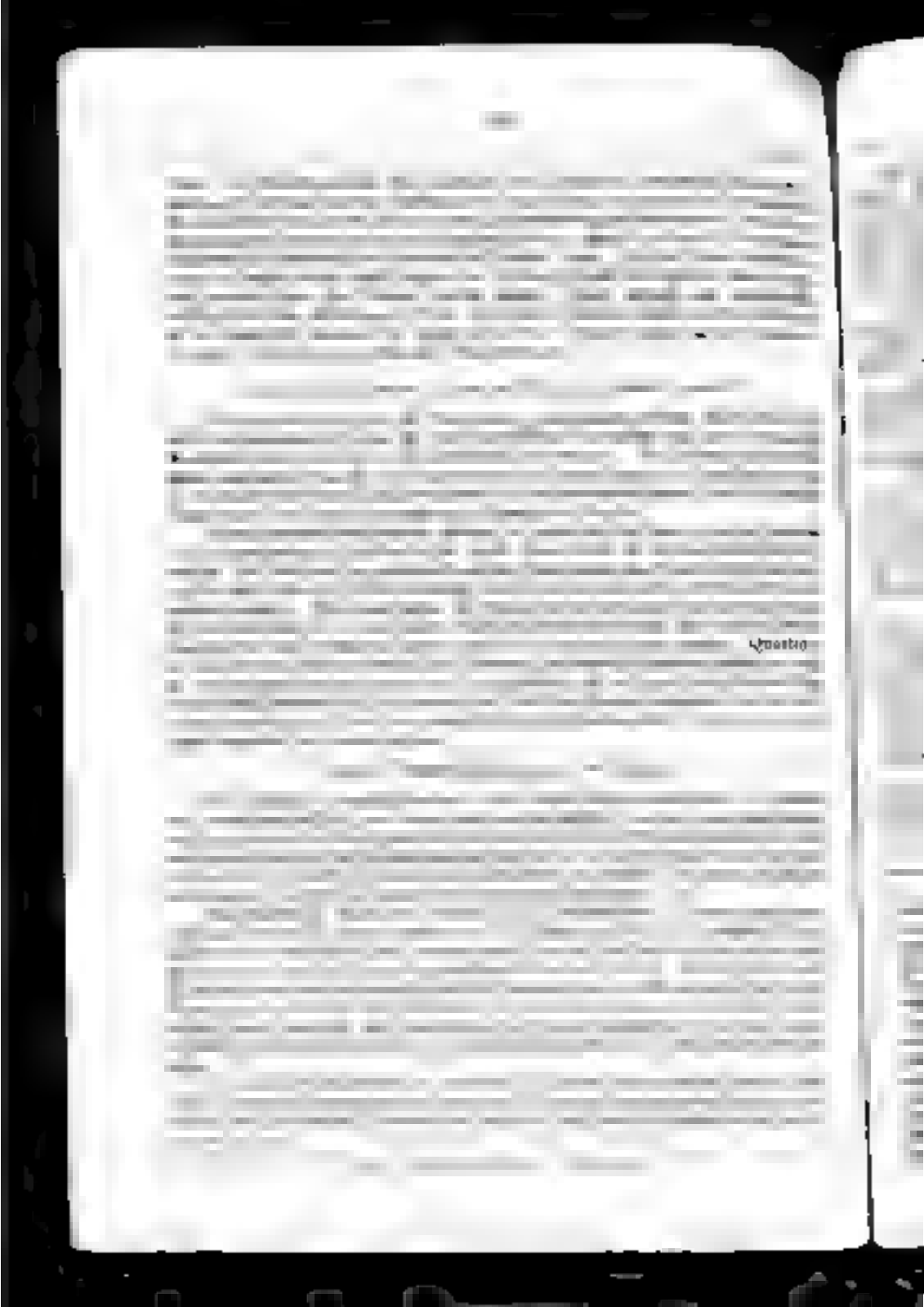
Total Recorded Product Under Ottawa Agency 1828 to 1881, 30th June

Ontario, 7 74. 82 pieces pine	494,824	other woods	22,005. 03	saw logs
Quebec 8,055,. 16	2109,2218		19,507.159	"
Total 1,728,848	706,162	"	41 5 2217	"

In the foregoing table it is to be observed that square timber and saw-logs only are included and all other wood goods are omitted as unimportant for the object of the table. The dues accrued from them are however included in the following equally brief exhibit of the revenue accrued from Crown timber dues in the upper Ottawa territories of Quebec and Ontario respectively from 1826 to 1881 inclusive, being from the earliest period of which there are any records in the Crown Timber Office Ottawa.

Period	Ontario.	Quebec	Totals.	Years
1826 to 1834	$ 158,037	$ 46,663	$ 215 101	9
1835 to 1851	934,736.66	480,442.33	915,379.66	17
1852 to 1857	463,006.33	353,373.33	816,387.66	6
1858 to 1866	897,765.55	999.961.66	1,906,697.33	9
1867 to 1881	2,377,885.33	3,439,891.33	6 19.77.33	15
1826 to 1881	85,732,506.66	84,321,340.16	$10,571,746.66	56

The collection of timber and slide dues being combined greatly facilitates and tends to secure the accurate collection of both. The same timber and the same men are dealt with at the same time. The returns of the timber rangers of their inspections supported by sworn statements of cullers, afford the means of effectively checking the accuracy of the certificates the lumbermen gave the deputy slide masters, which through careless error or fraud might be quite erroneous as to the numbers of saw-logs especially and as to where they came



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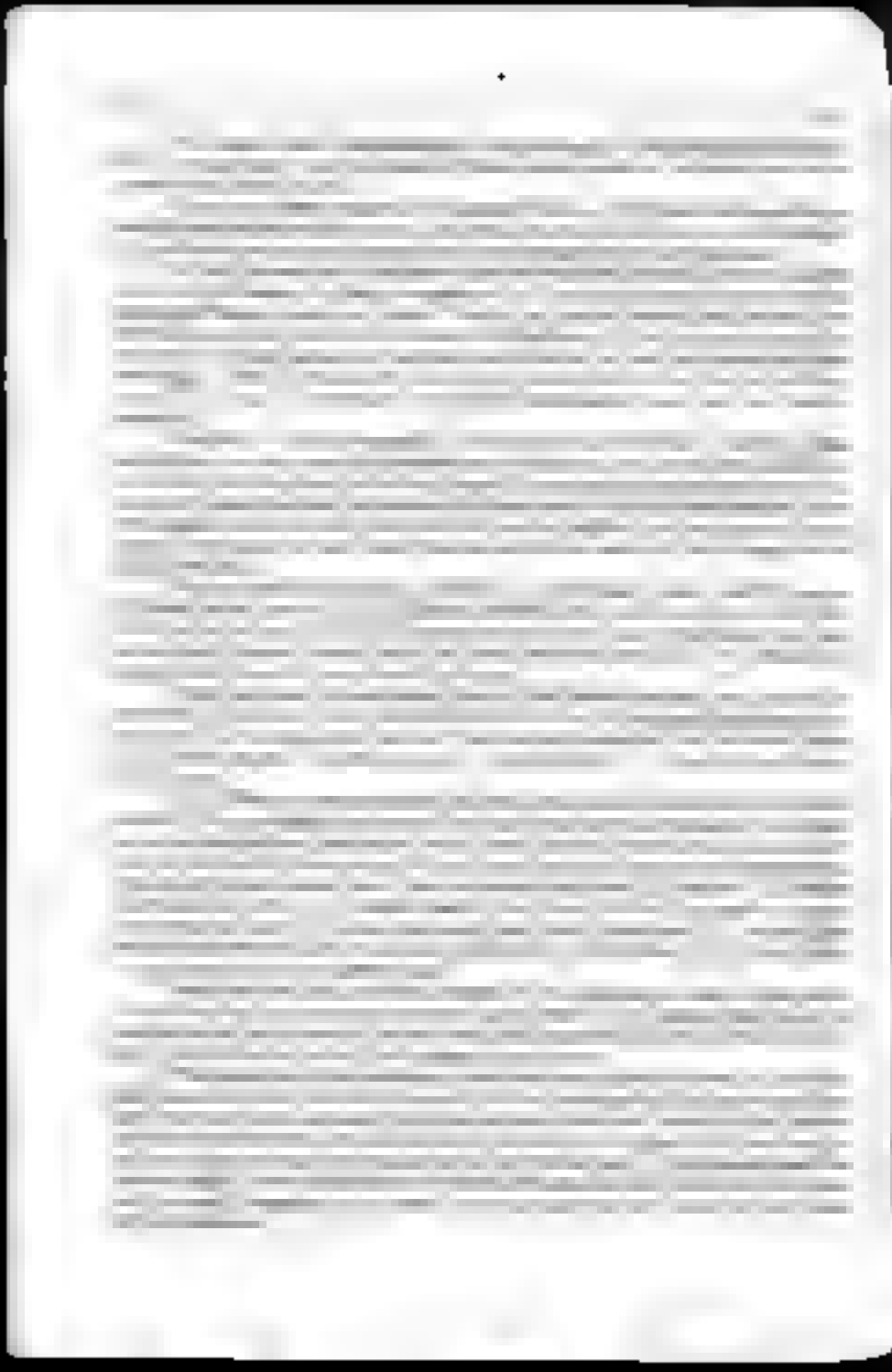
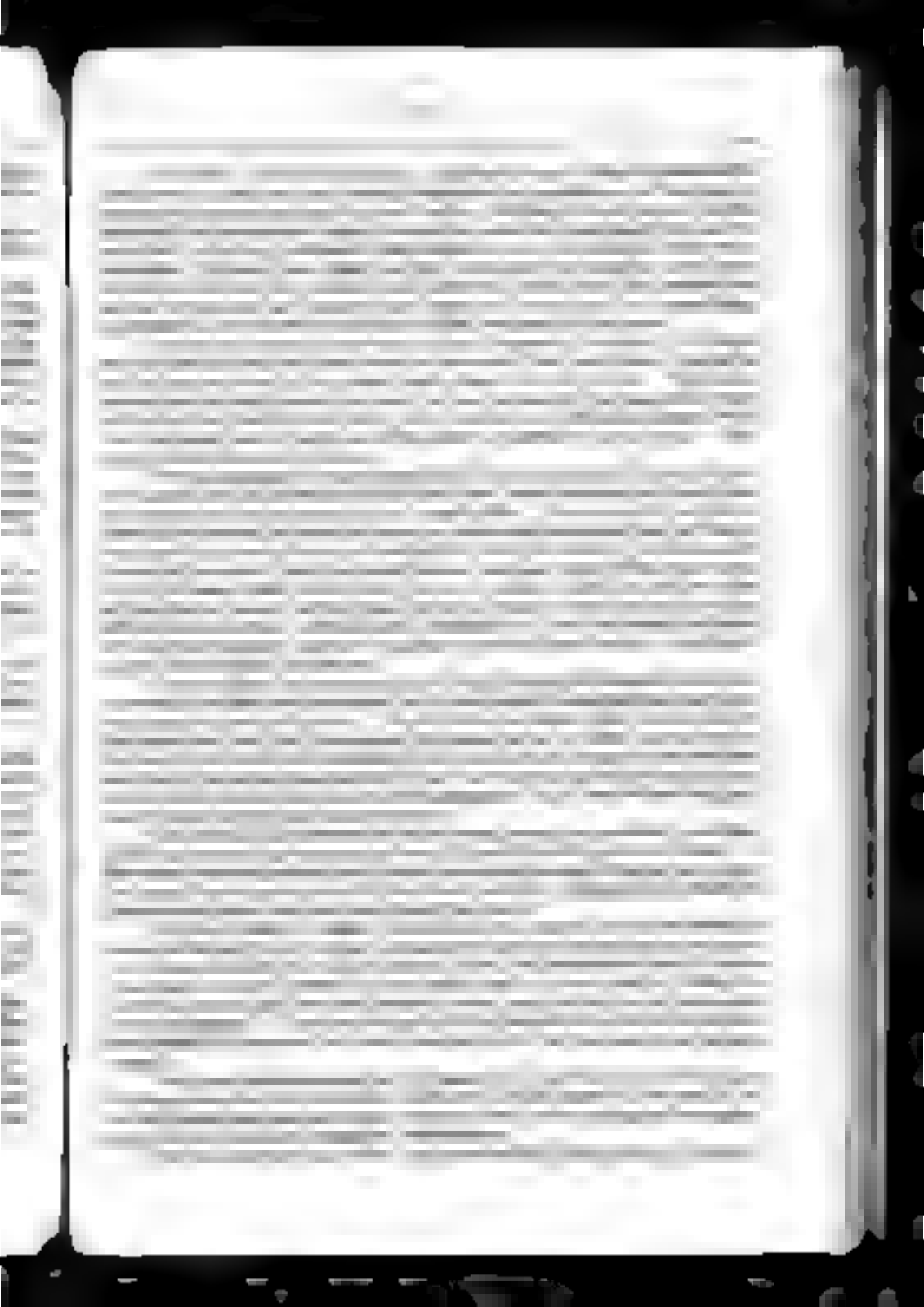
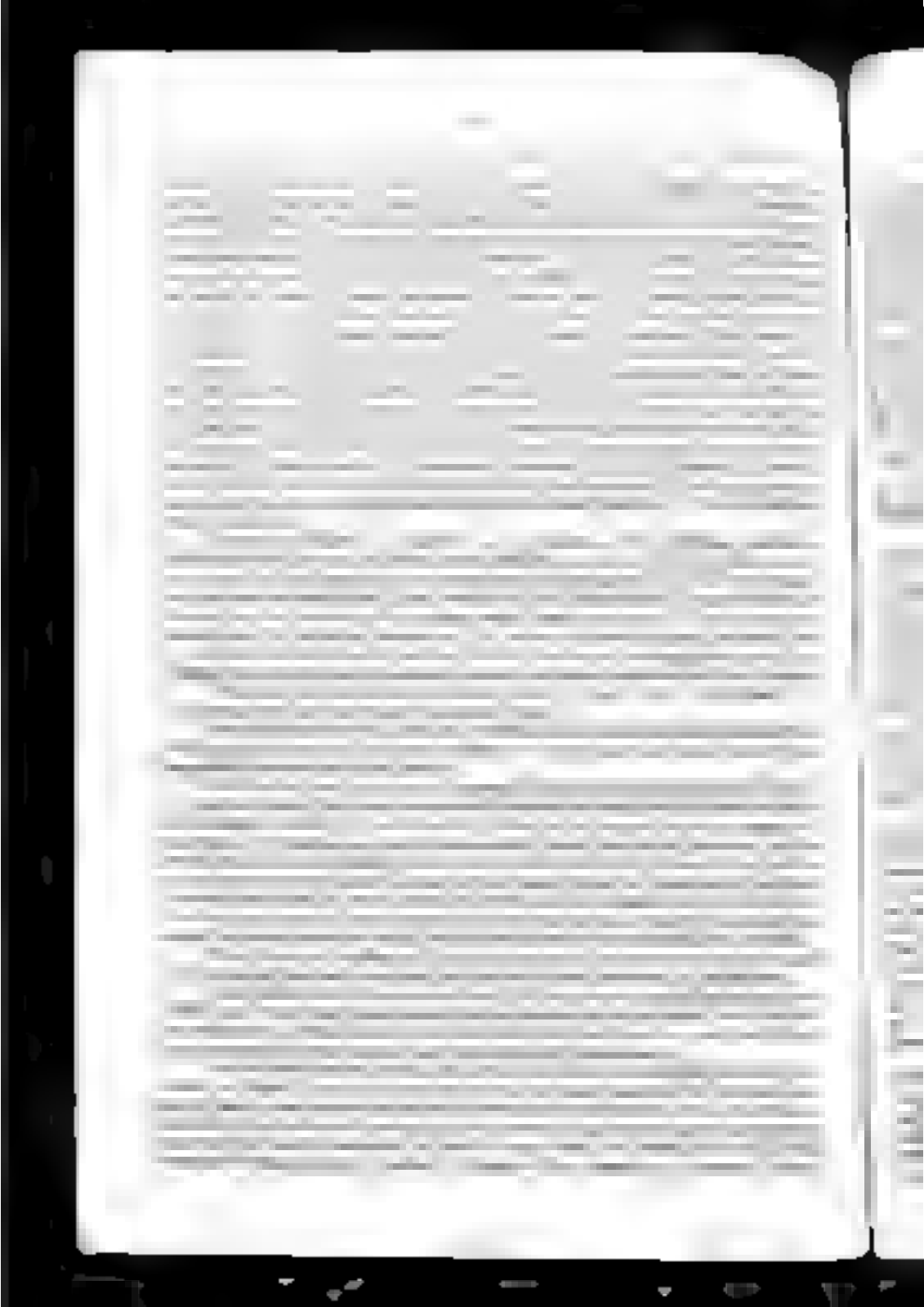
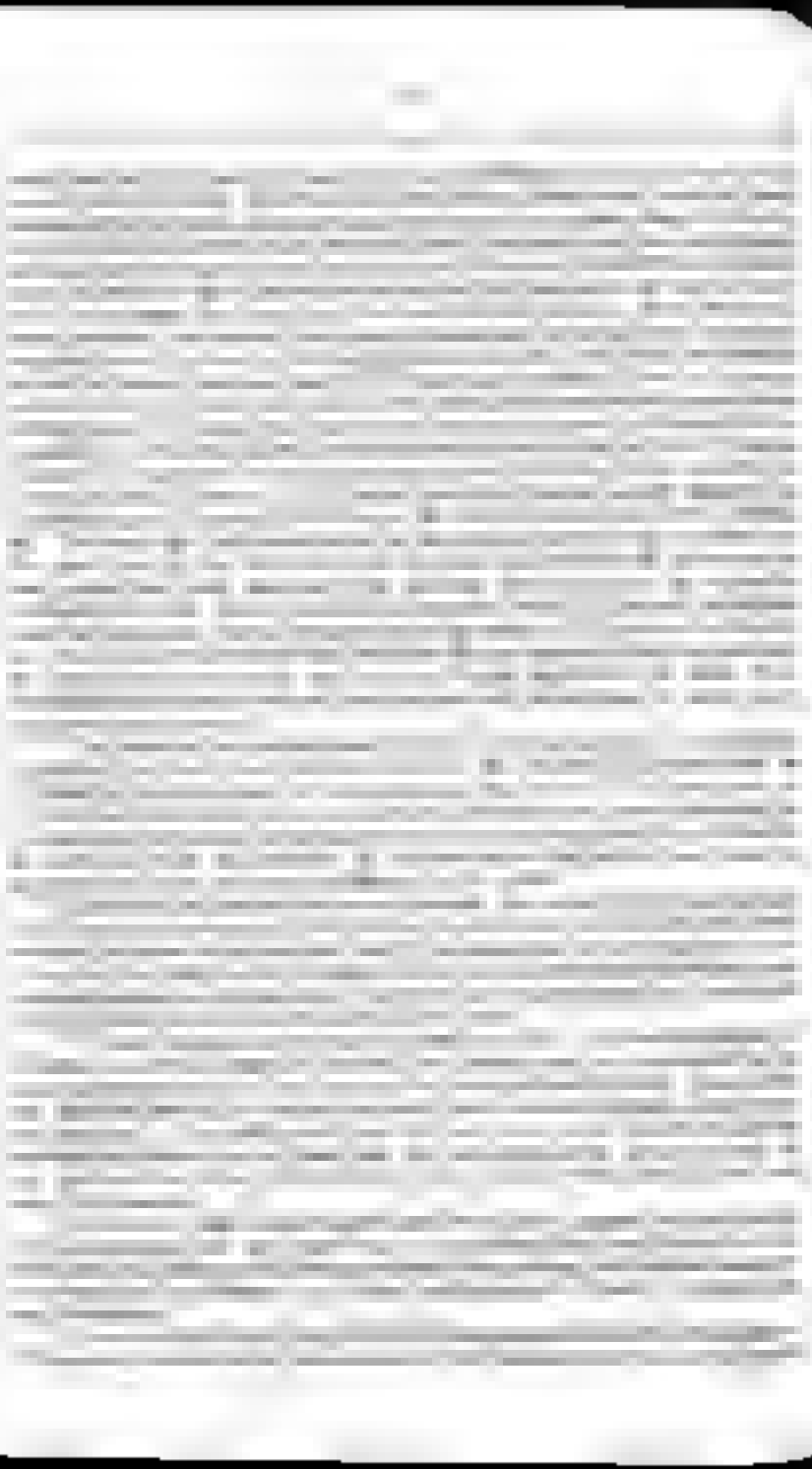
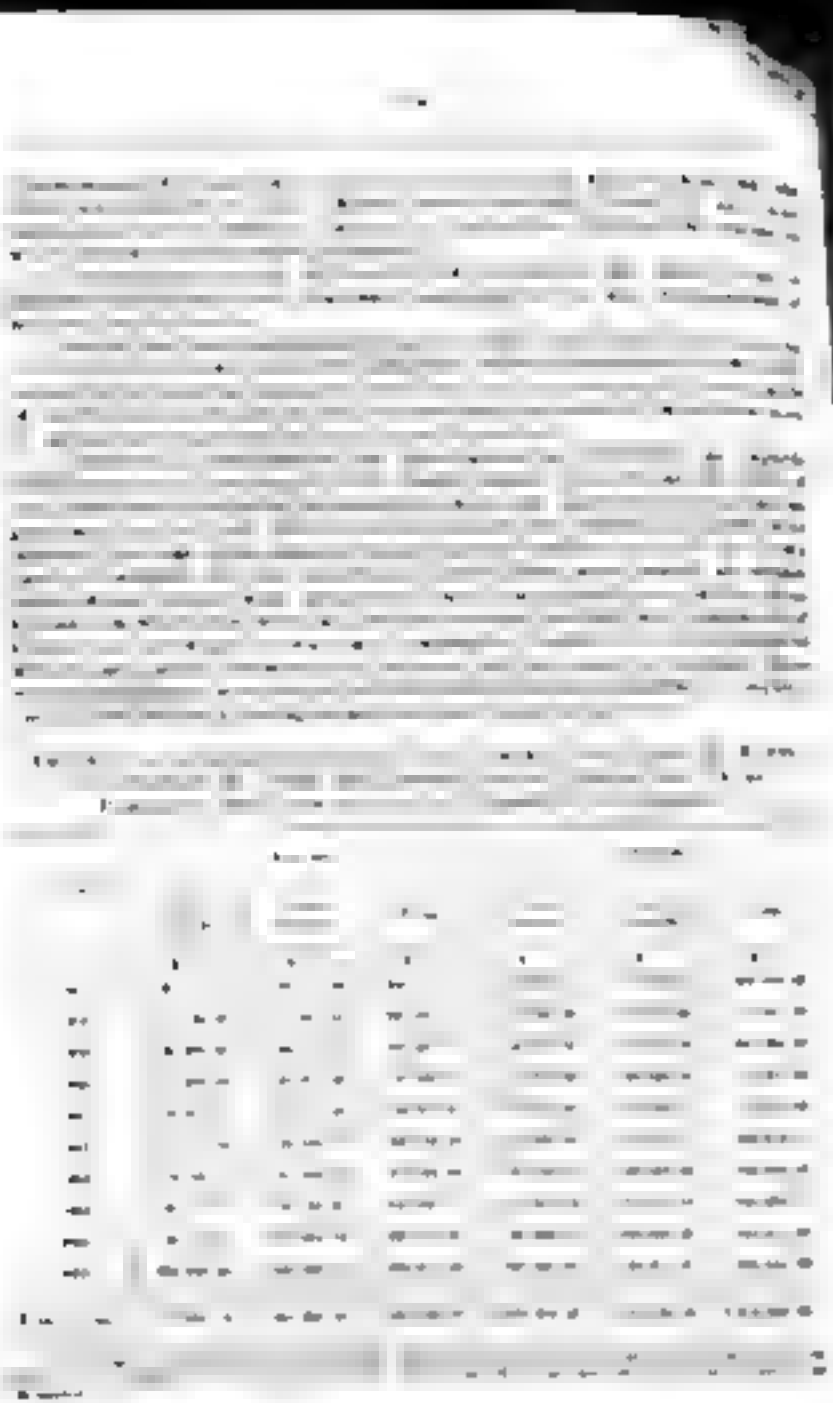
limit the business of the shipper to one ship or

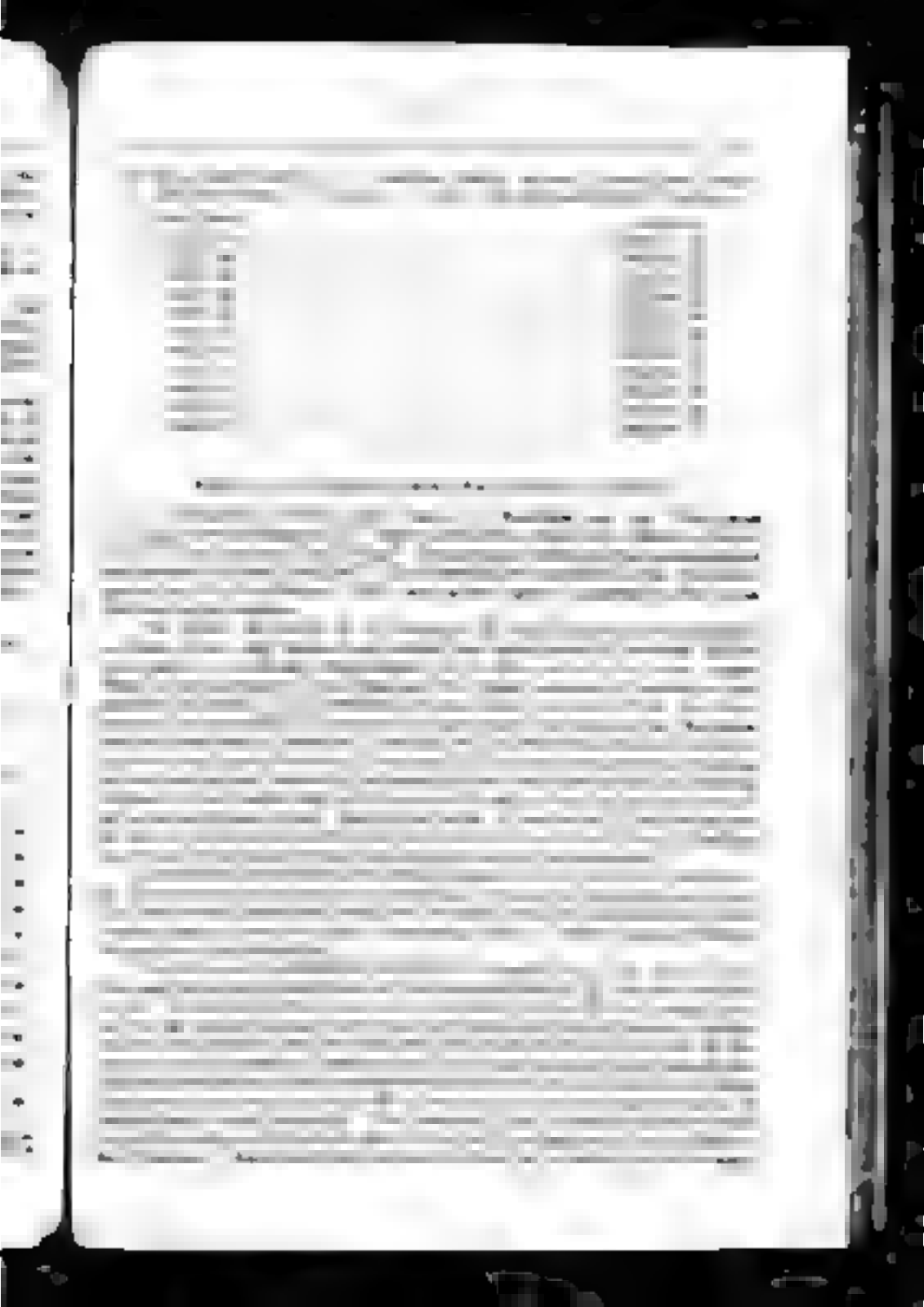












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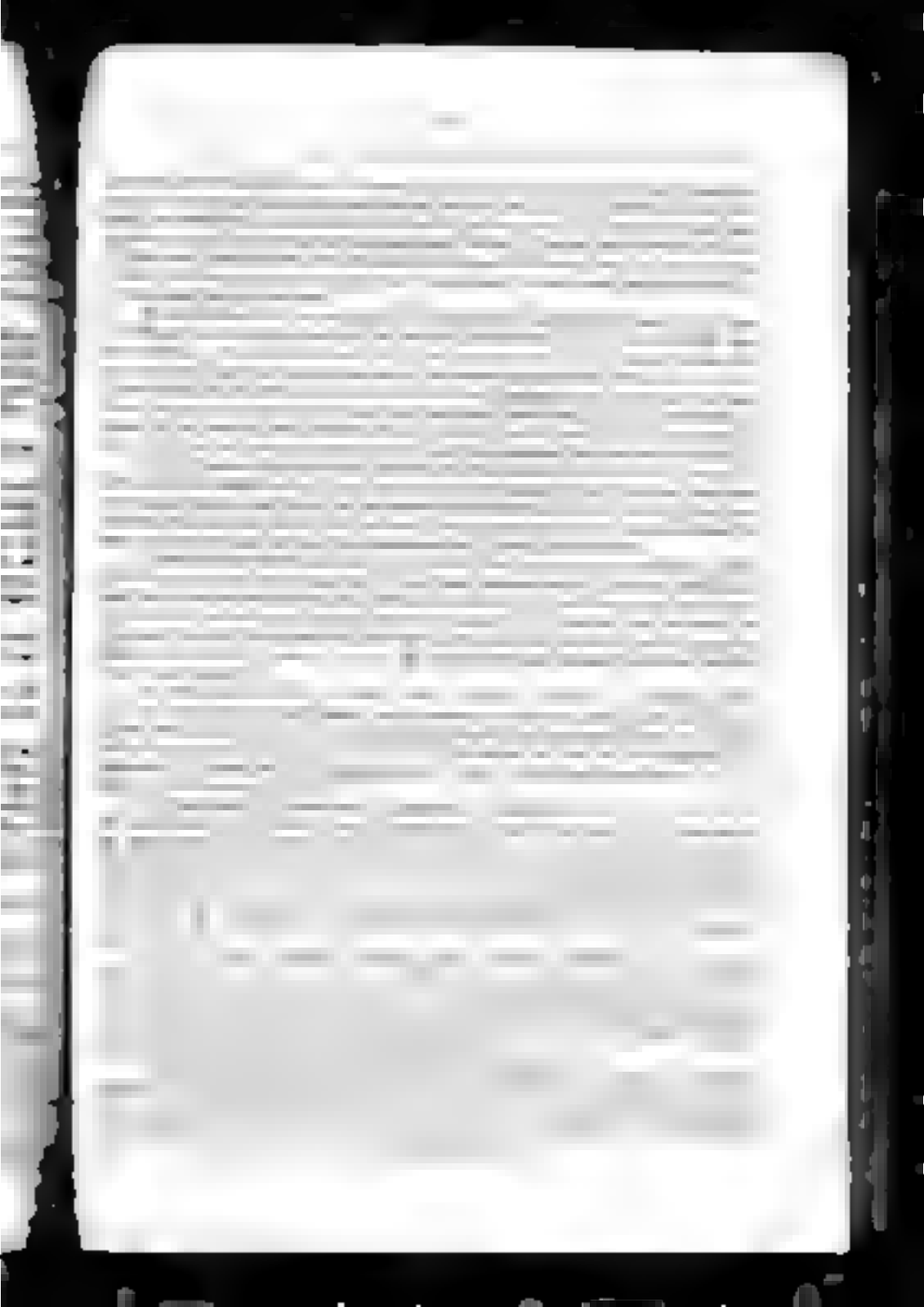

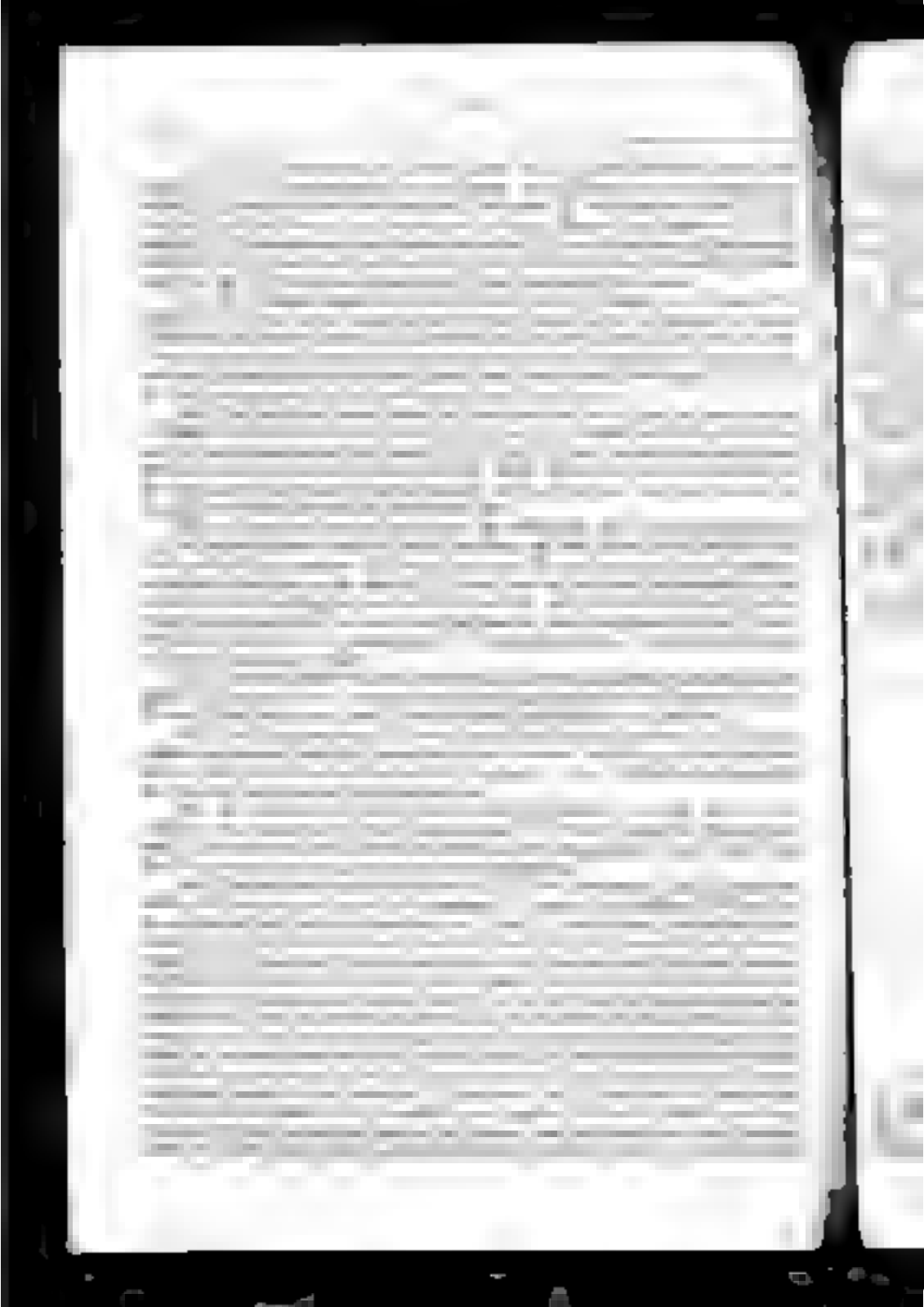

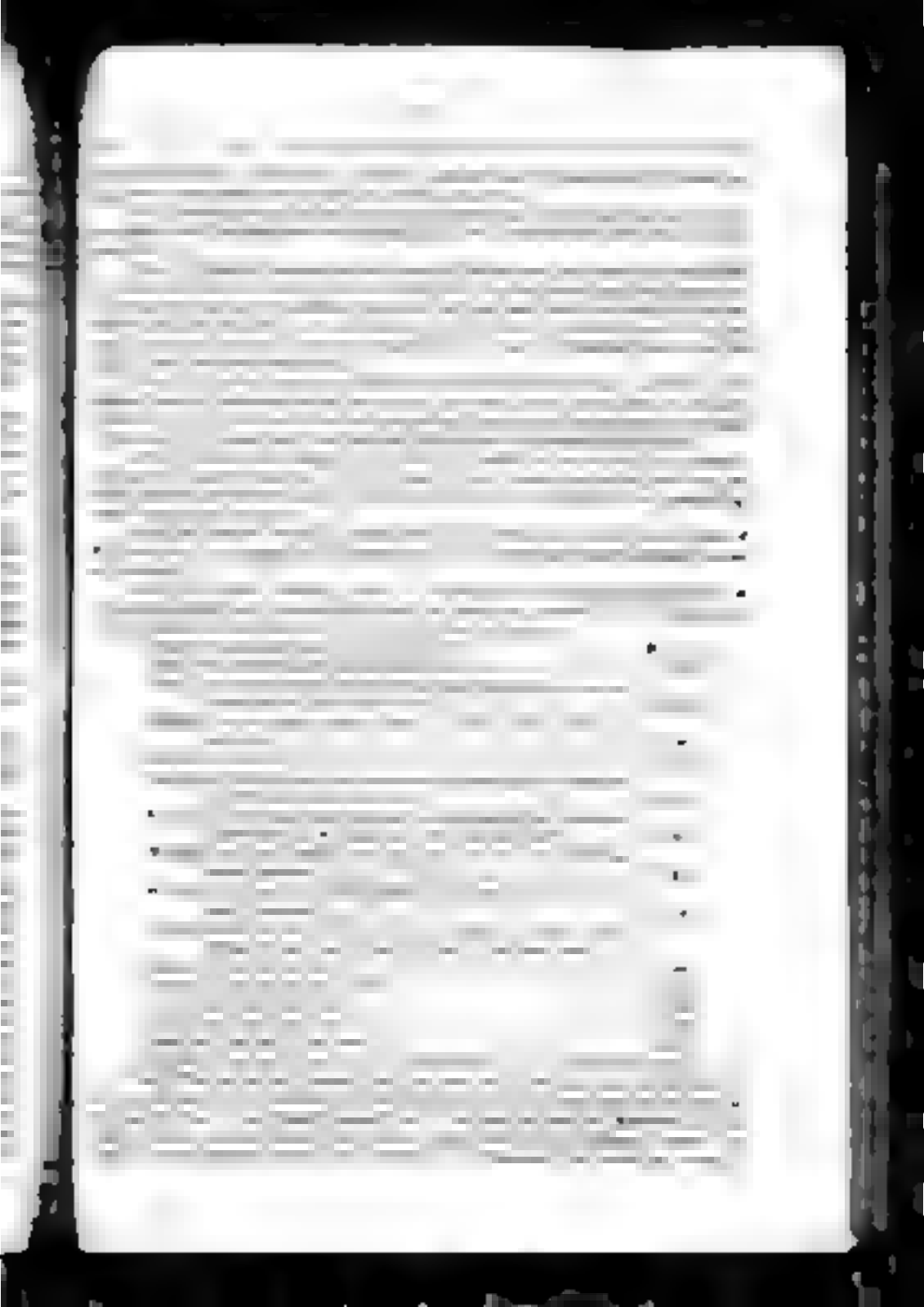

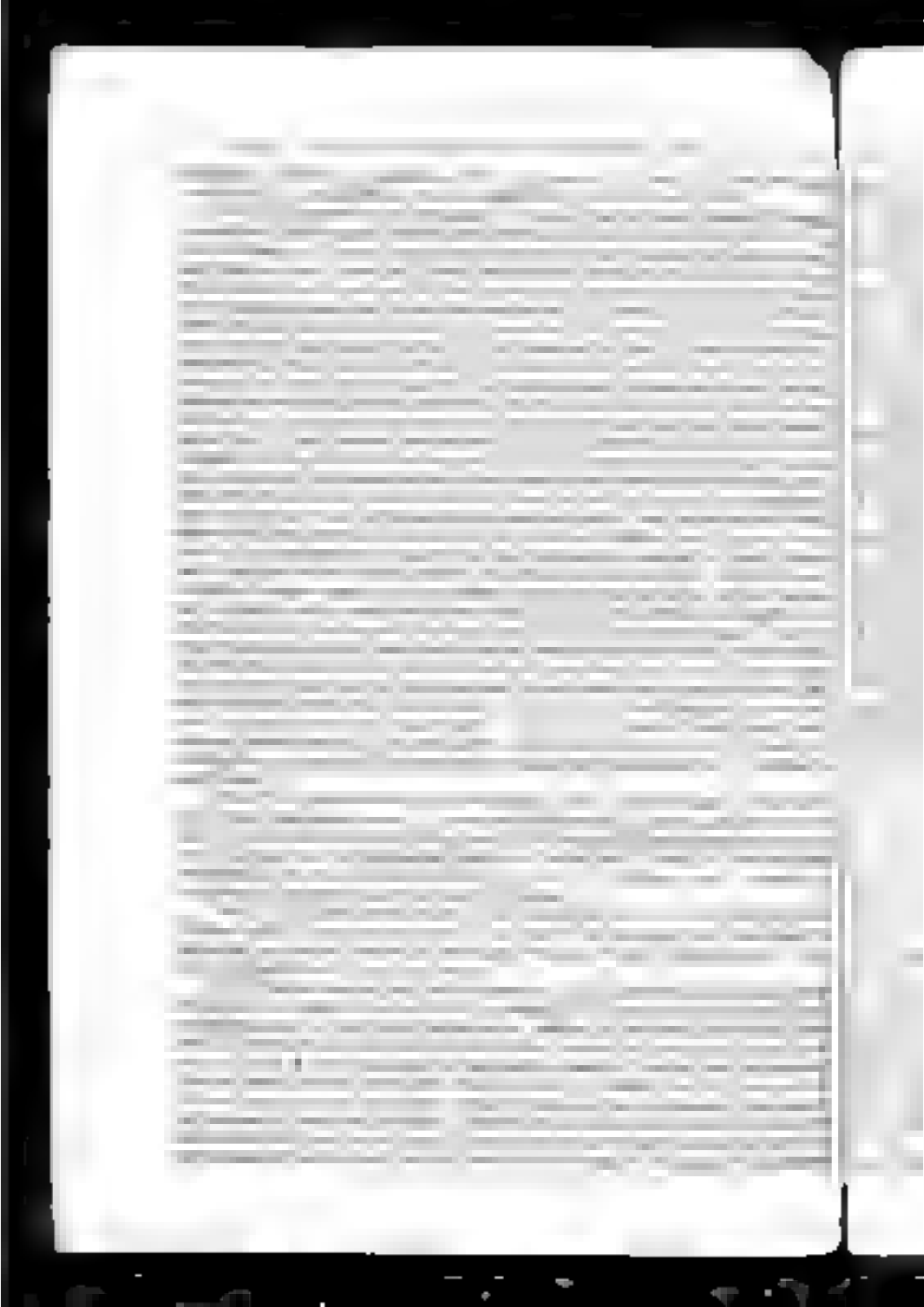

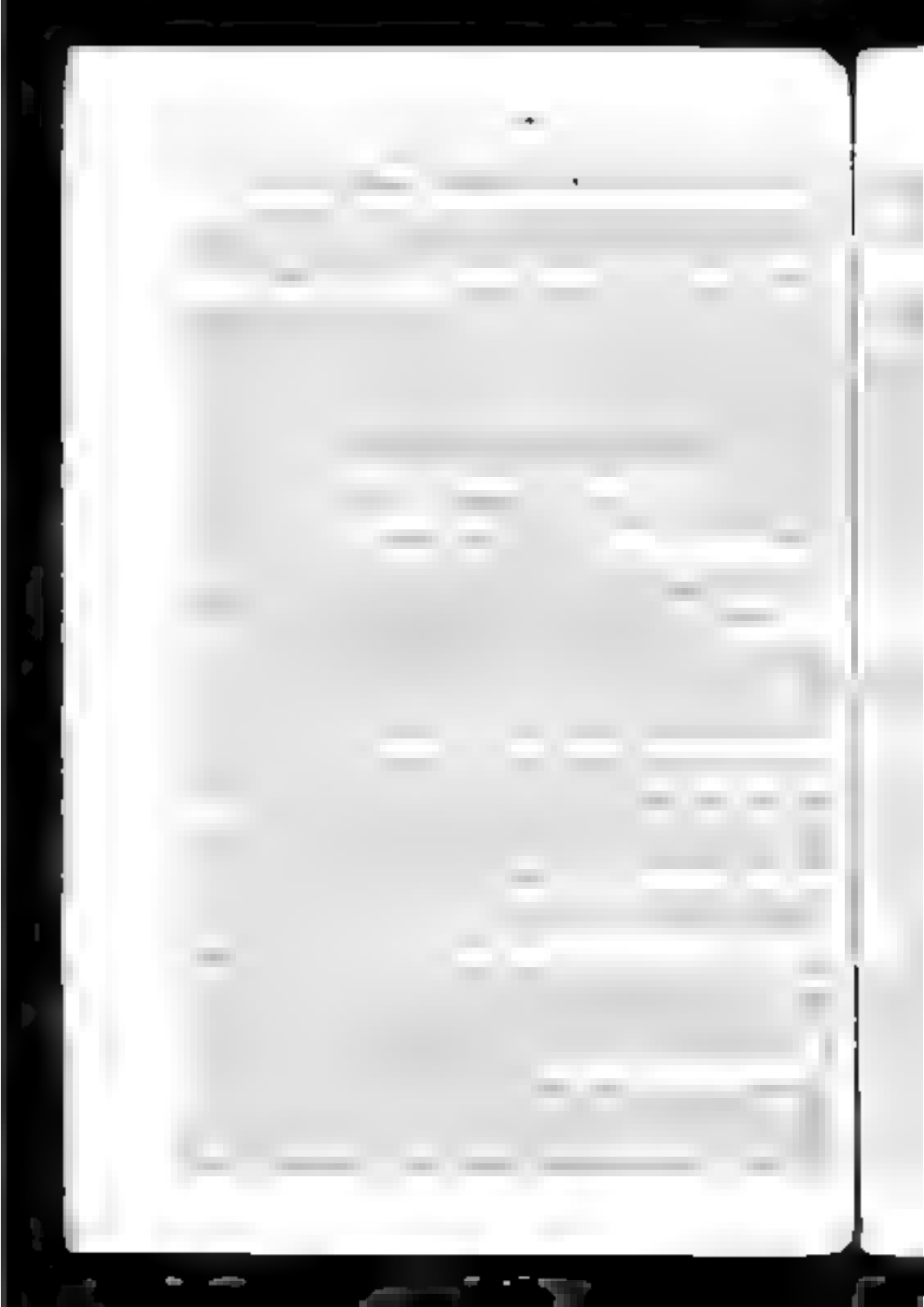

ing is in connection with the manufacture of square pine and board, or whether some other especially as further to agree upon which and in the relative sum of the upper portion of the tree where the cross cut has been made if the tree is inverted i.e. one-sixth of the butt of the timber in scaling off or trench be applied the diameter of the upper part of the tree which is left in the woods, but which if drawn would be valuable as a saw-mill where it could be put into various qualities of timber either for the domestic use or export. The waste referred to has been noticed by the department for some past but under the regulations passed the present and the terms under which licenses to cut timber are sold will not have limit for the next years to found different or upon a system which we obtained so long, and in which there are so many serious interests and so much capital involved.

Pulpwood Exports of Canada 1910

The following table taken from the Statistical Year Book of Canada 1910, p. 34 gives the exportation of pulp in the wholly manufactured during the year 1910

Timber.	Ontario	Quebec	New Brunswick	British Columbia	Nova Scotia	Manitoba and N.W.T.
Sawlogs B.M.	327,371,263	420,680,000	109,588,44	4,027,000	2,648,4	30,000,000
Square timber C.	3,775,829	2,101,791	85,614			
Boom poles	158,341	6,340	173			
Hardwood, n.e.s.	2,2	17,15				
Railway ties No.	87,410	156,500	29,439			
Cordwood cords	84,17	2,4	356			
Telegraph poles	386	421	2,173			
Misc. as to	149,381		2,10,501			
Axle poles, timber and belt cords	2,47	10,799	386			
Pile timber B.M.	481					
Shingles M		2,251	171			
Hoops, staves, etc. No.		220	2, 31			410,916
Posts and rails No.	1,353		8,128			136,400
Blocks, poles, etc. M			42			
Logs, n.e.s.	2,2 72	2,2,082	2,42,	21,178		182,180

Trans-Atlantic shipment only. Includes in square timber. Railway ties. Pulp and lumber wood included.

The Ontario Fire Act

The Ontario Act, Cap. 8 R.S.O. was passed by the Legislature of Ontario in 1873 with the view of preventing the occurrence of the fires which have wrought so much devastation among the forests of the Province

[illegible] men of good judgment and well acquainted with the limit should be selected by the limit holder [illegible] [illegible] to the Department to be placed in charge of the limit and [illegible] [illegible] of any [illegible] the Department reserving the right to [illegible] the [illegible] of men [illegible] [illegible] any limit, and also to report or remove any man whom [illegible] unfitted to discharge the duties of the position.

It is hoped that limit holders will recognise the necessity of recommending men of good judgment and [illegible] [illegible] who [illegible] [illegible] [illegible] with horses or [illegible] [illegible] as [illegible] [illegible] [illegible] in the success of the system [illegible] [illegible] [illegible] that in effect the results expected [illegible] [illegible] [illegible] [illegible] supervision [illegible] [illegible] [illegible] that they [illegible] [illegible] and [illegible] to perform their duties.

With respect to compensation the Department considers that the man in charge of a limit should be paid [illegible] [illegible] which should cover wages and ordinary expenses, and where subordinates are [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] will be [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] Act, and a copy of the instructions will be [illegible] to the limit holder.

As the limit holder is reaping a large proportion of the benefit, it is intended that he should bear one-half of the cost of men and expenses which may be incurred under the system.

The Department will pay wages and expenses and charge to each limit holder his proportion, which will be a charge upon the limit, and account will be rendered at the close of the season, when prompt payment must be made.

[illegible] [illegible] [illegible] [illegible] [illegible] this scheme [illegible] will [illegible] [illegible] to the Department to that effect, stating the [illegible] [illegible] the number of men required for [illegible] season [illegible] [illegible] of men you would [illegible] [illegible] [illegible] [illegible] you would recommend for appointment on your limits.

AUBREY WHITE,
Assistant Commissioner.

DEPARTMENT OF CROWN LANDS,
Woods and Forests Branch,
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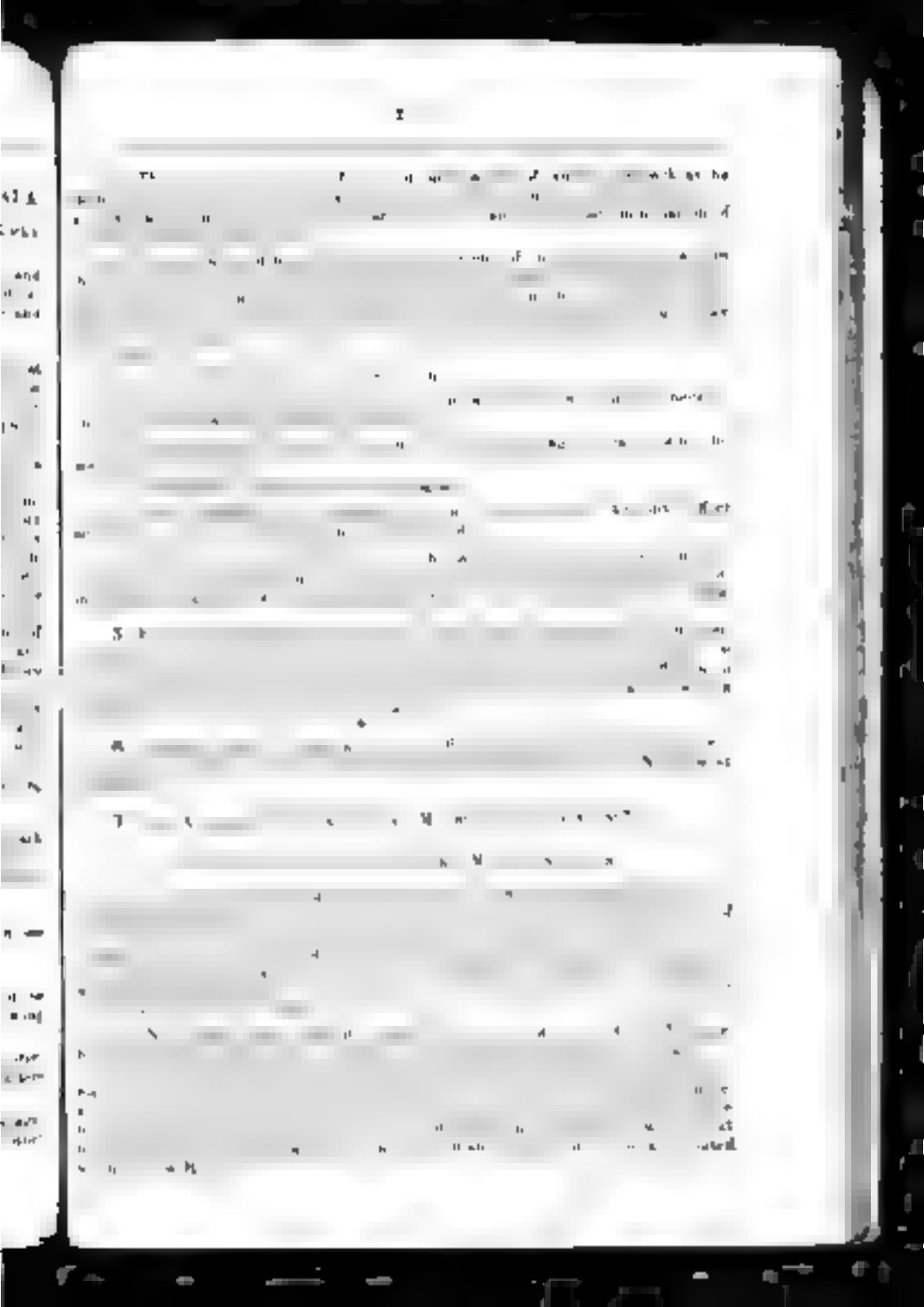

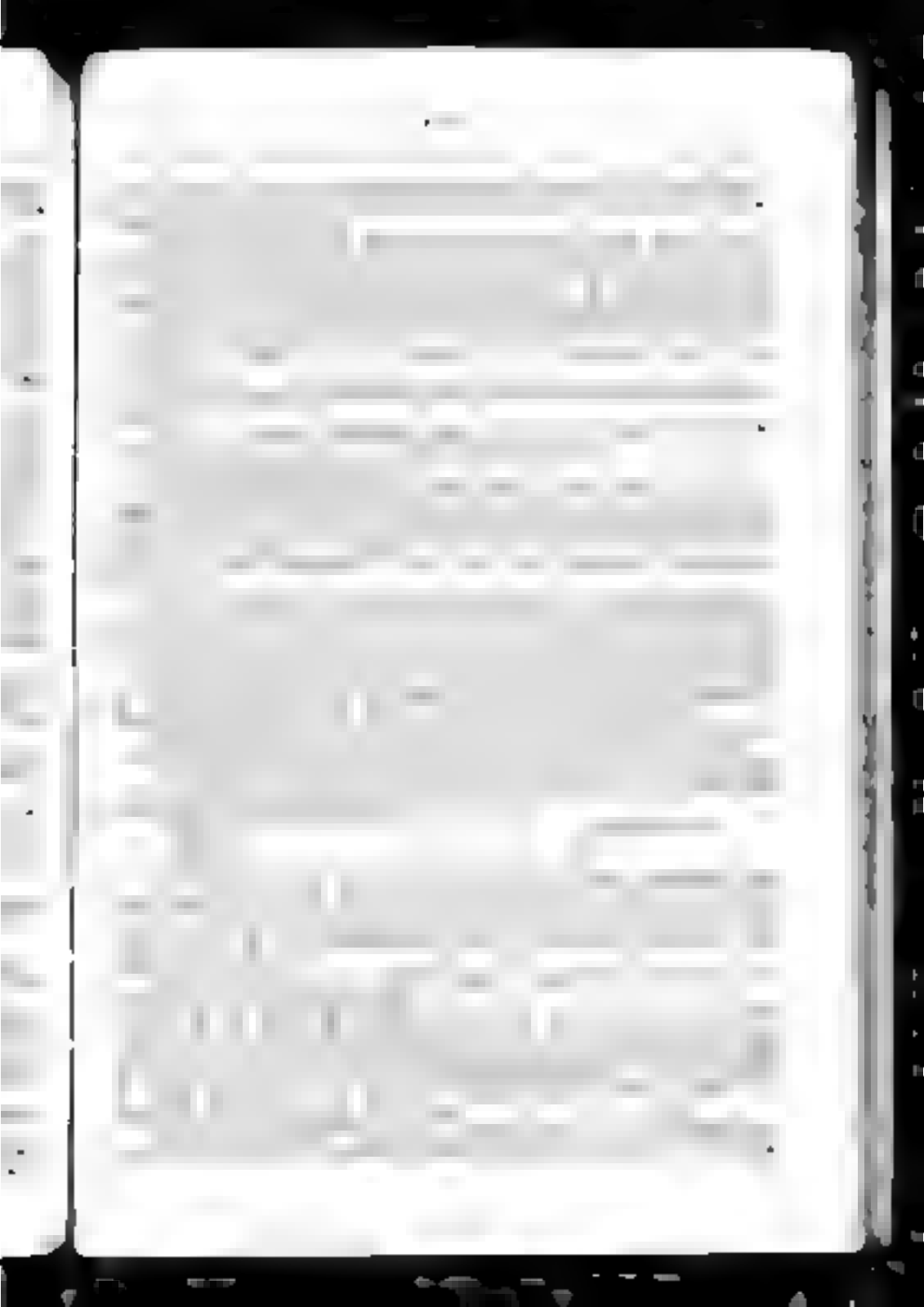

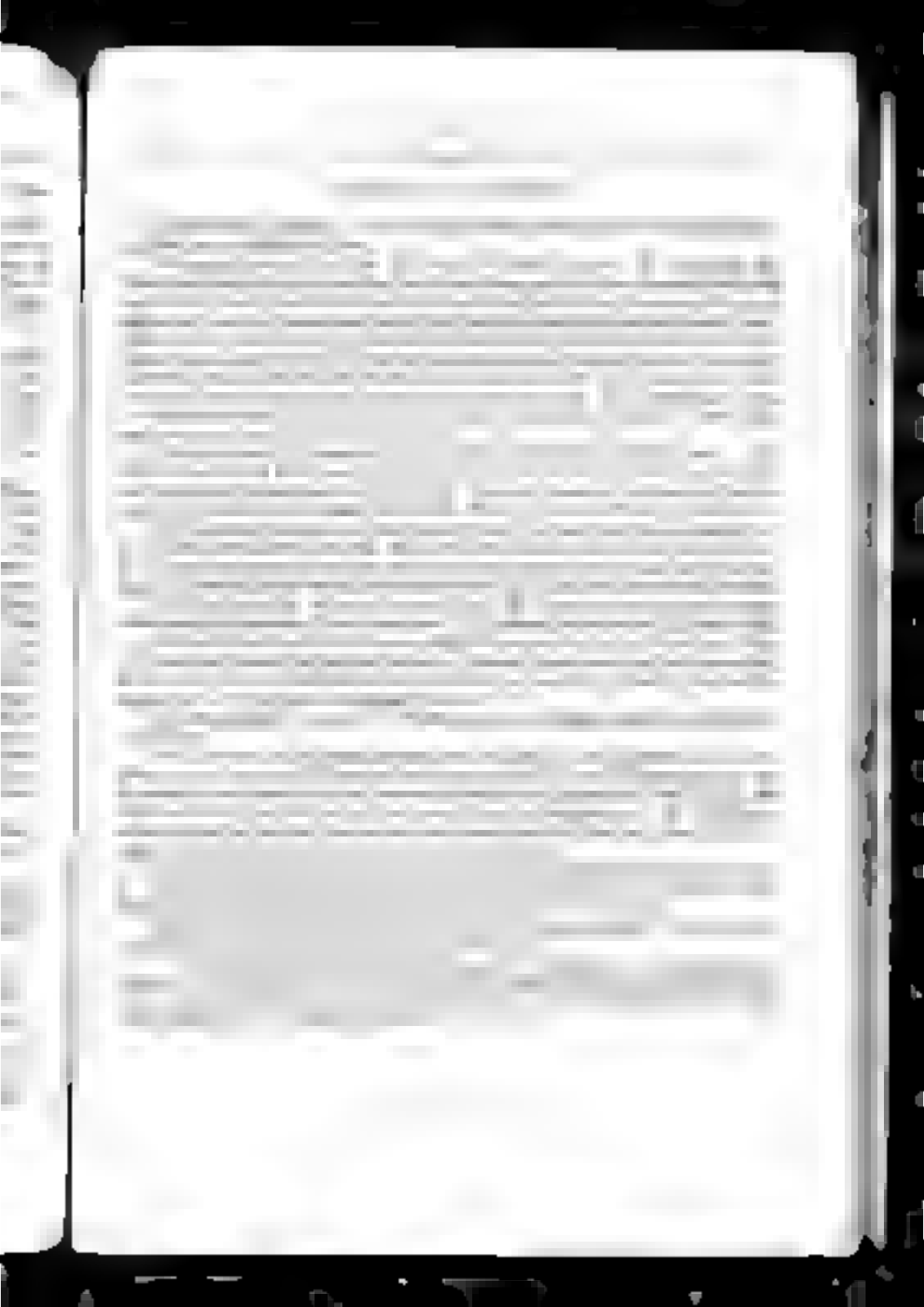

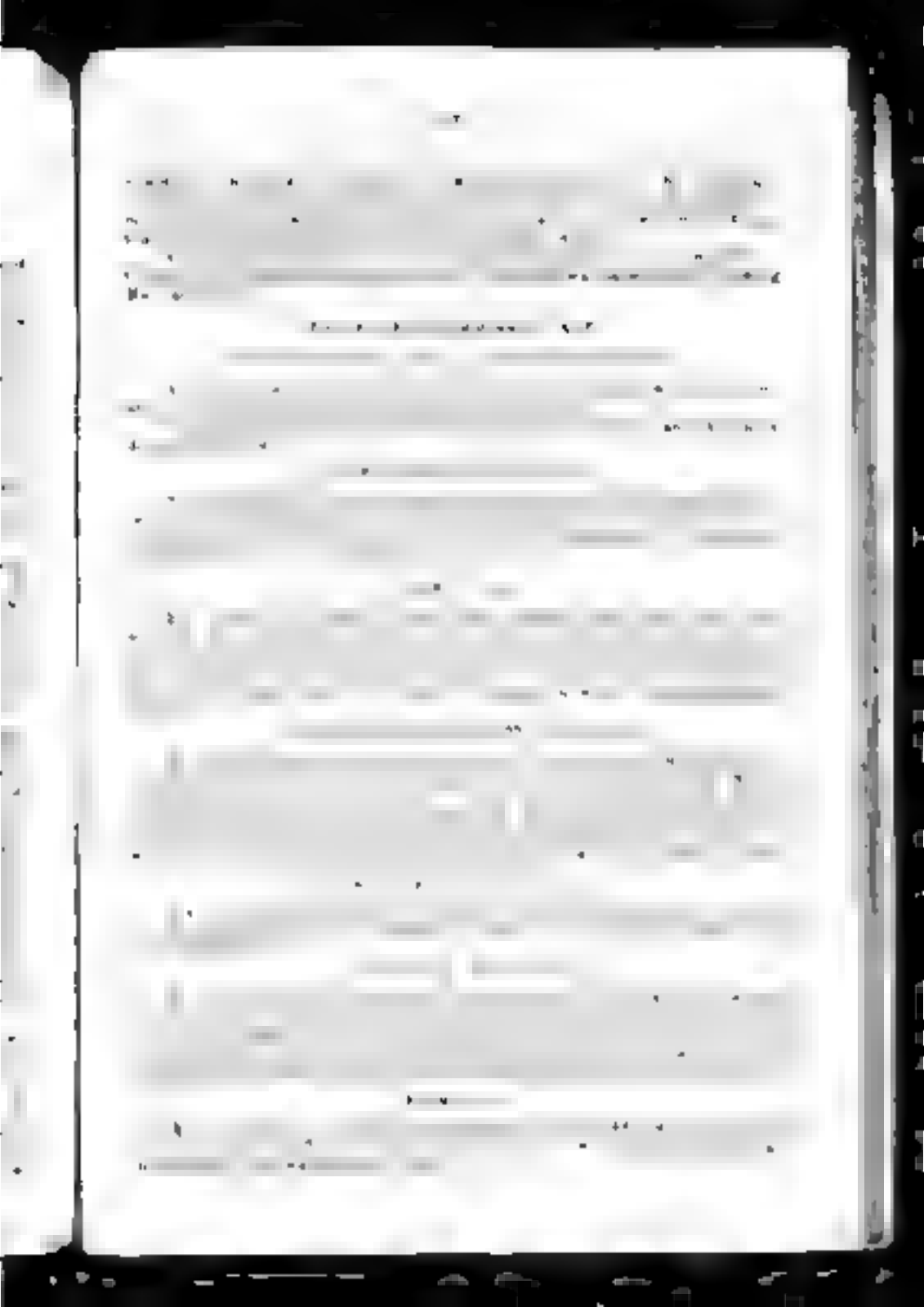

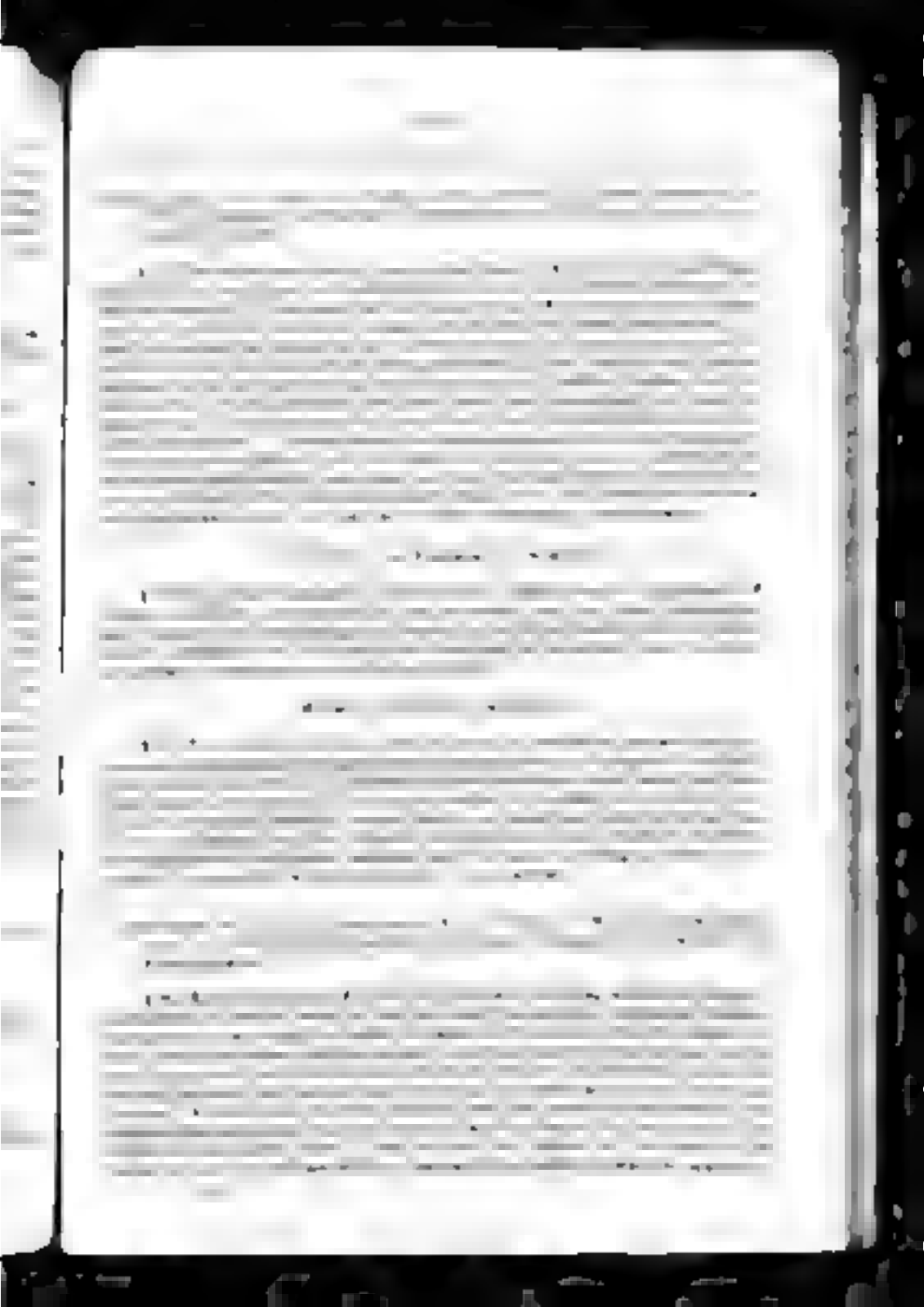

shall be the duty of the firewarden

§ 23 The fire-warden

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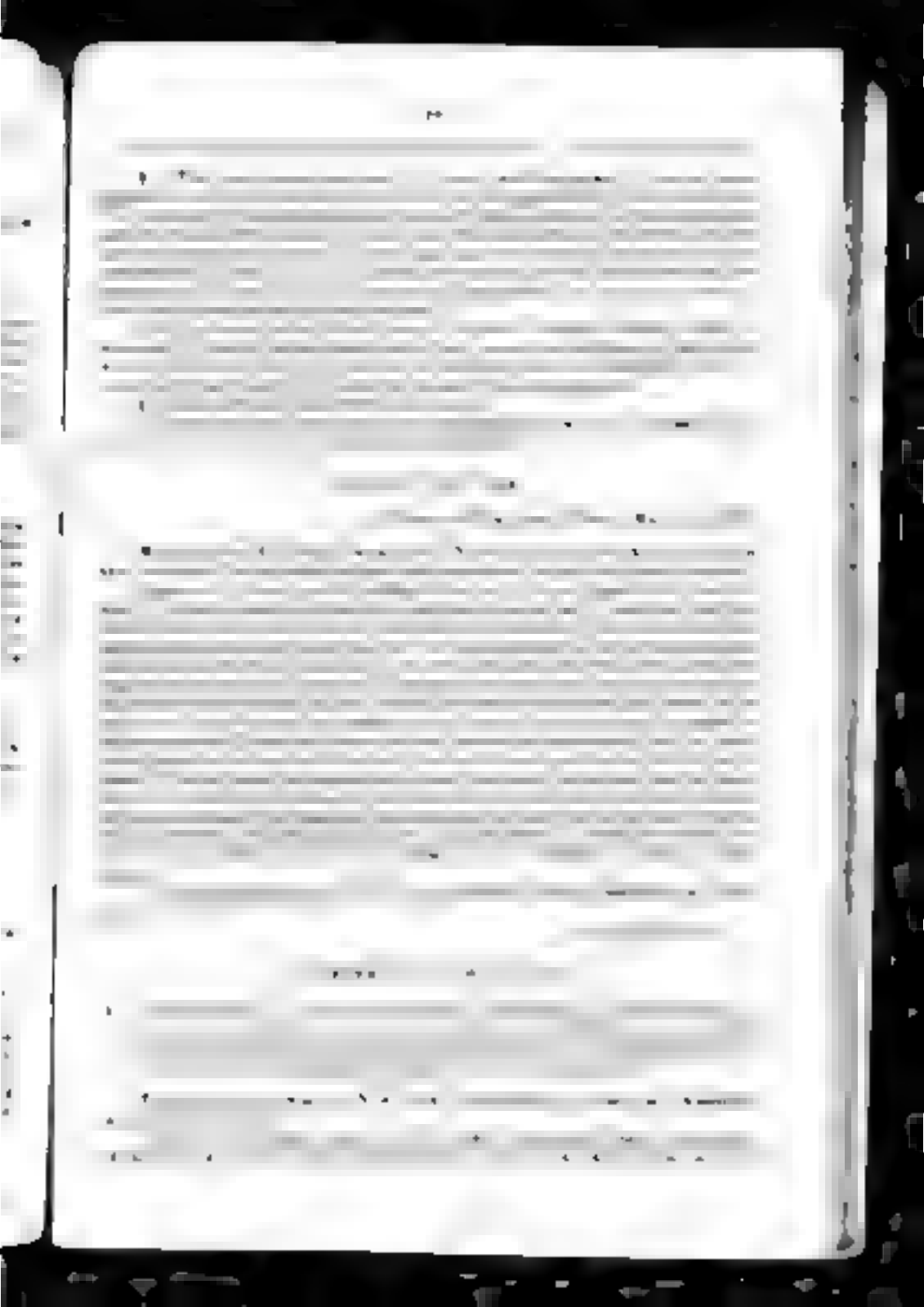

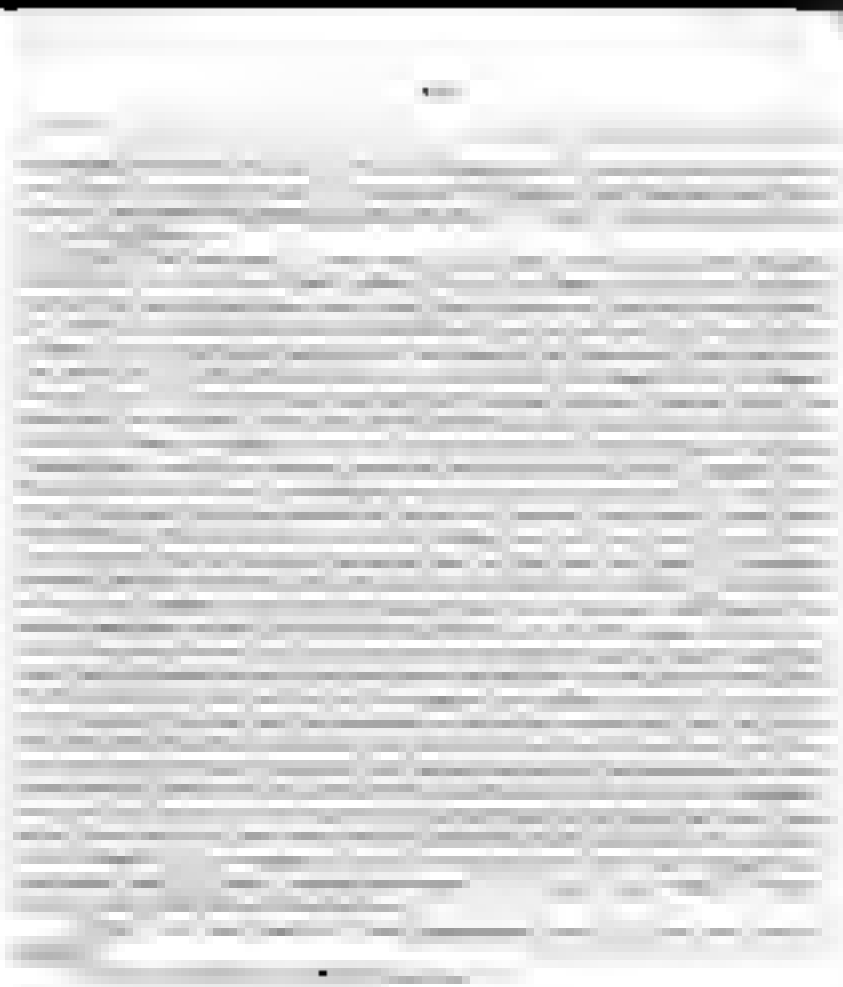

THE FOREST COMMISSION ALBANY N. Y. 189

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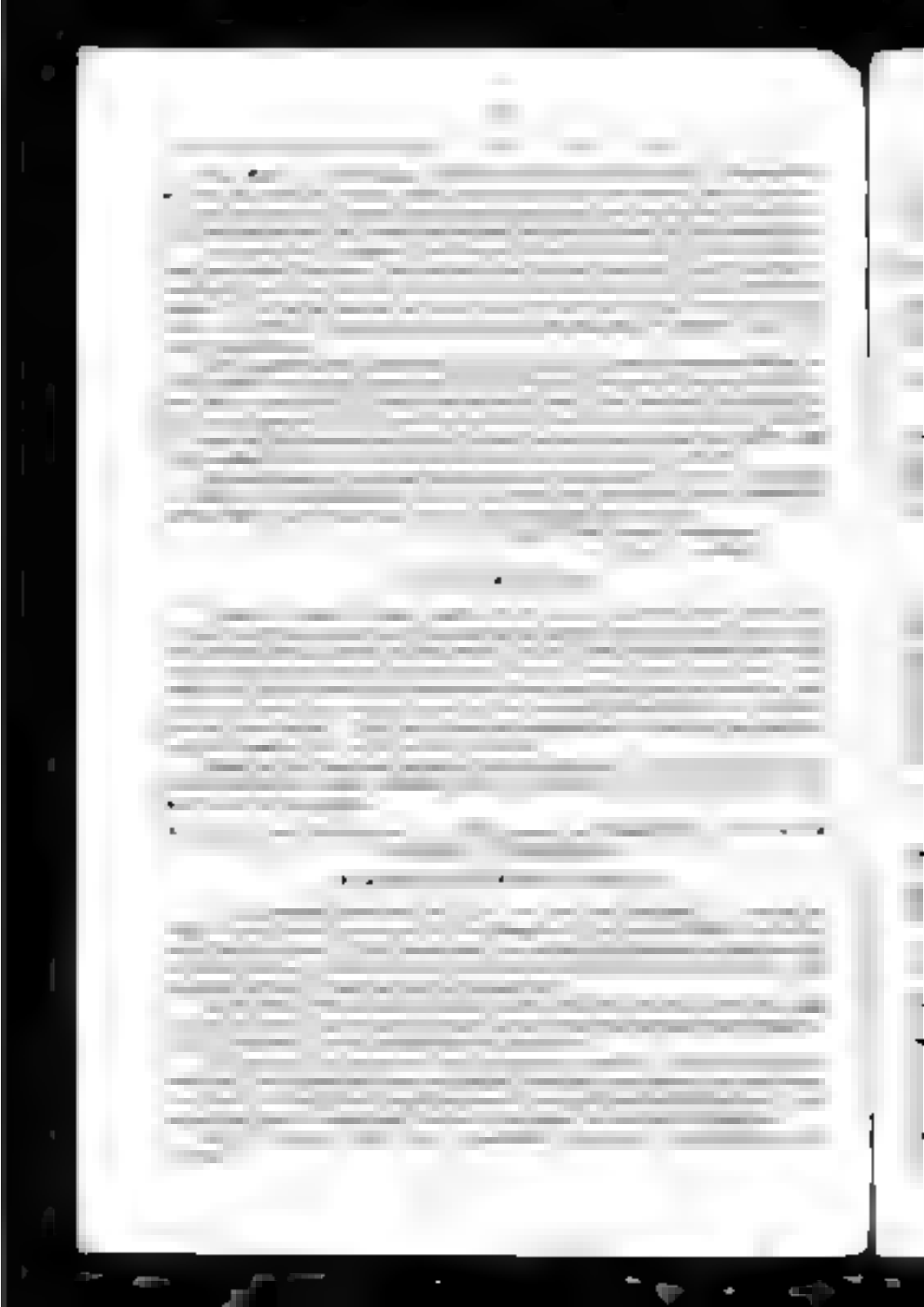

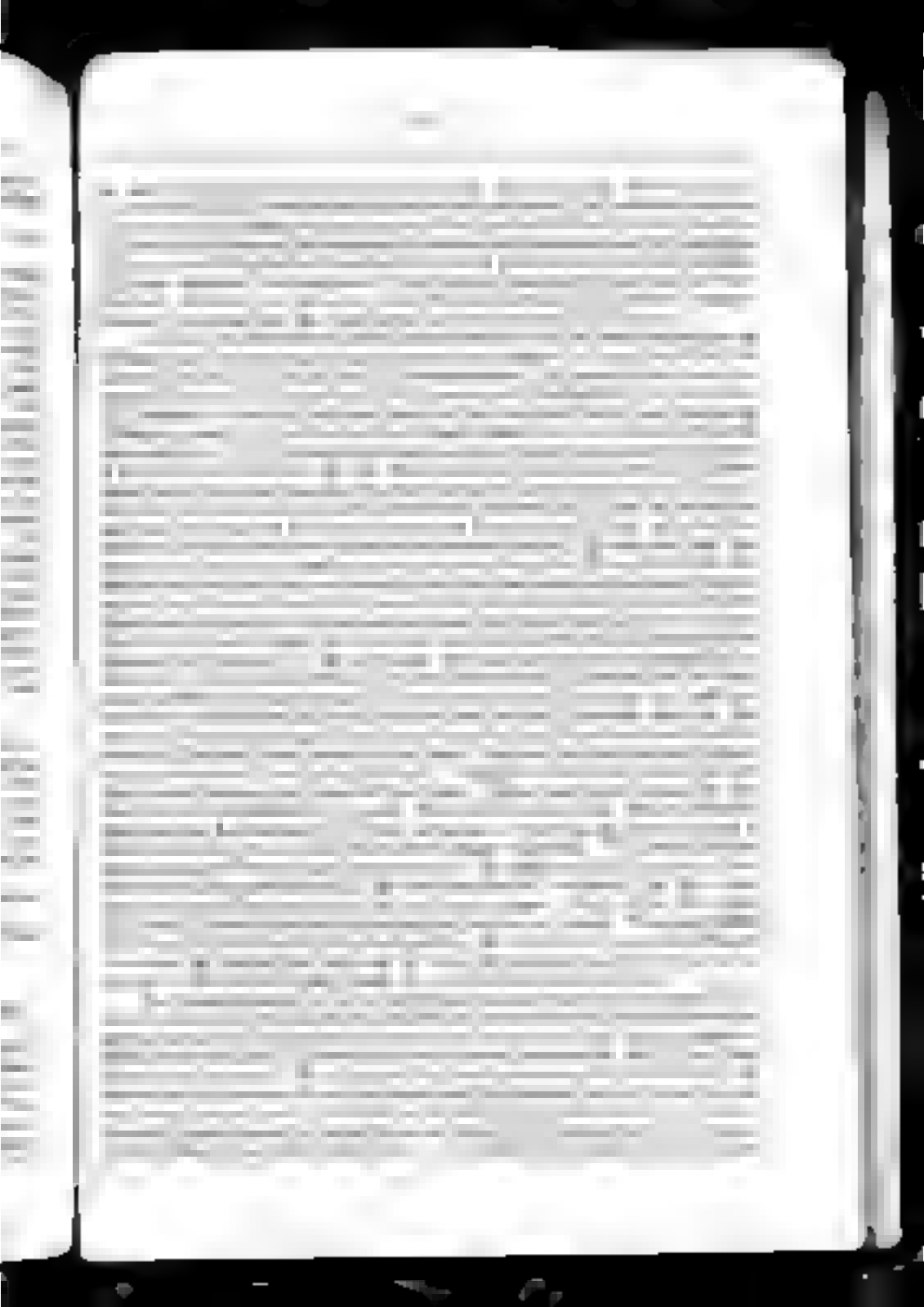

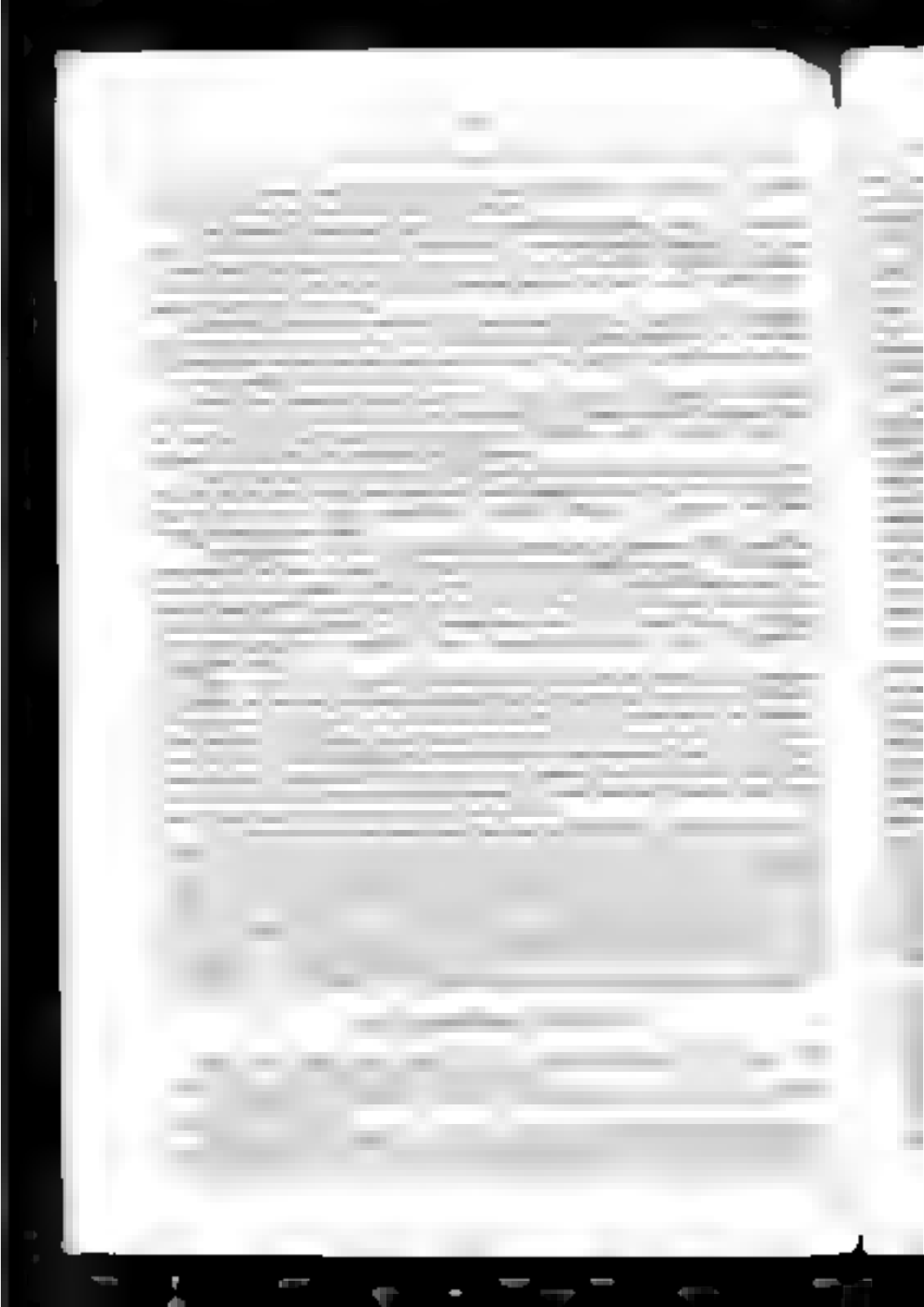

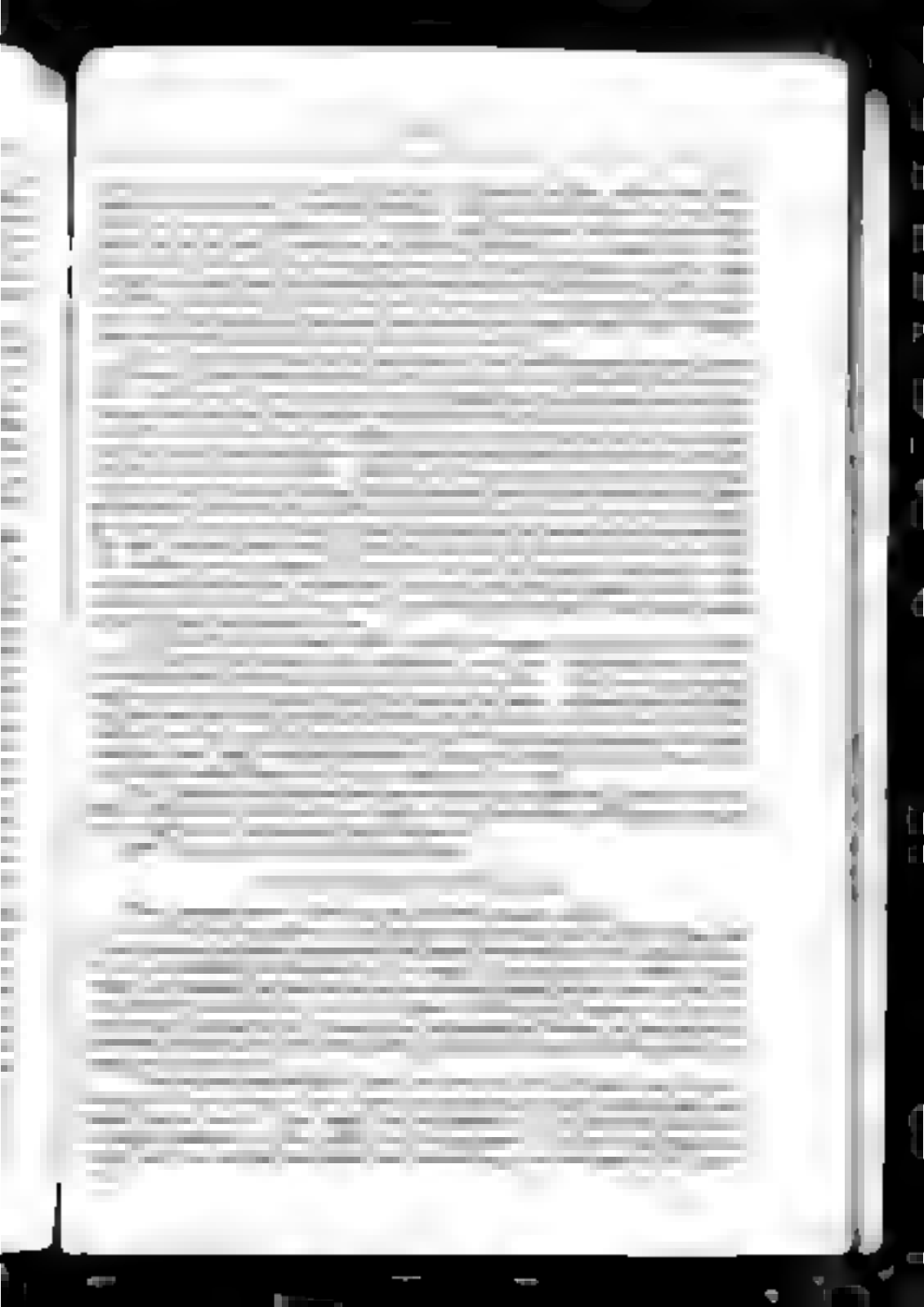

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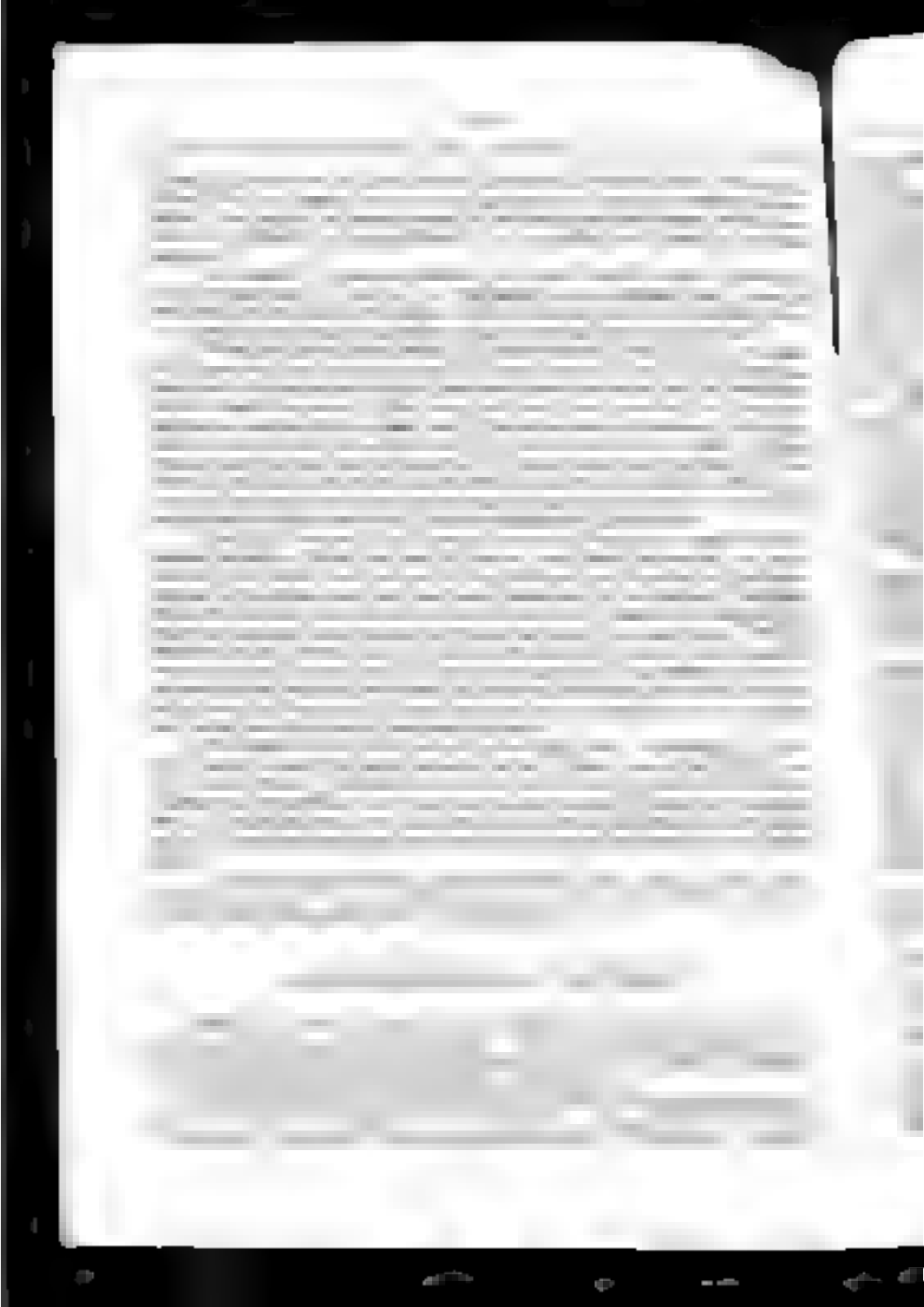
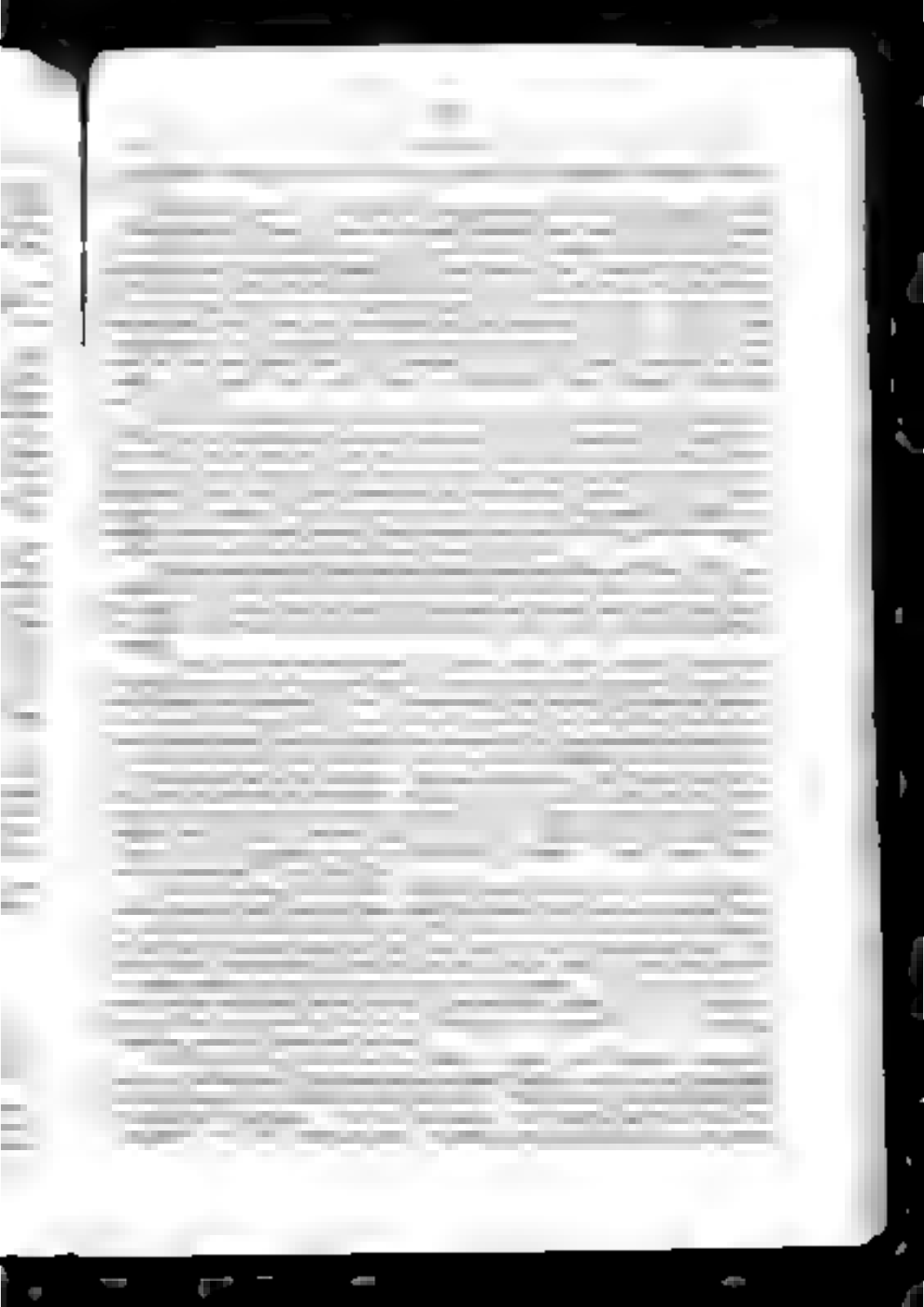
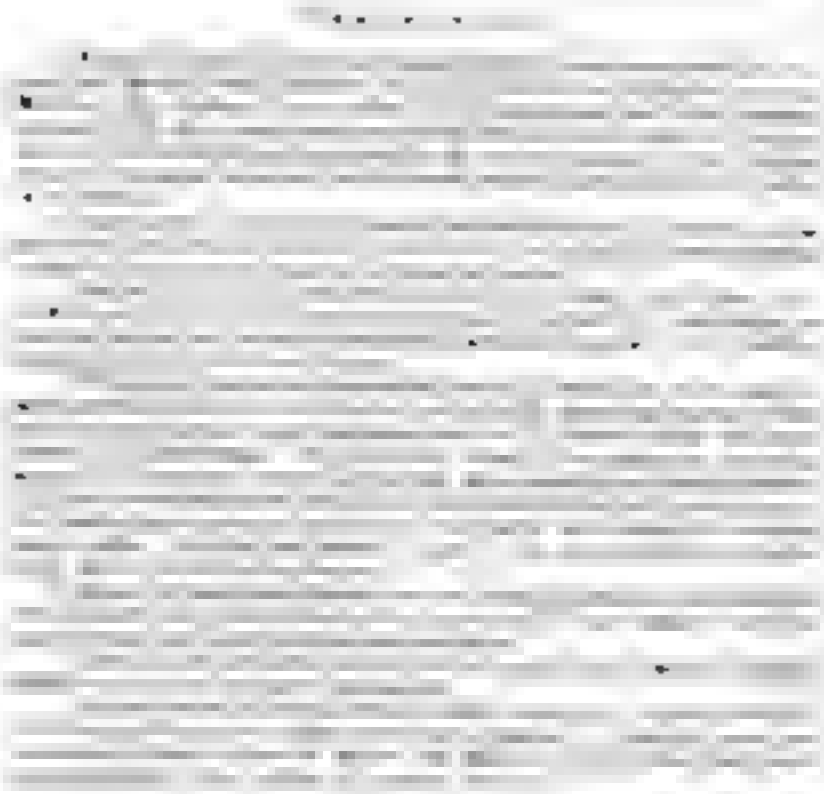
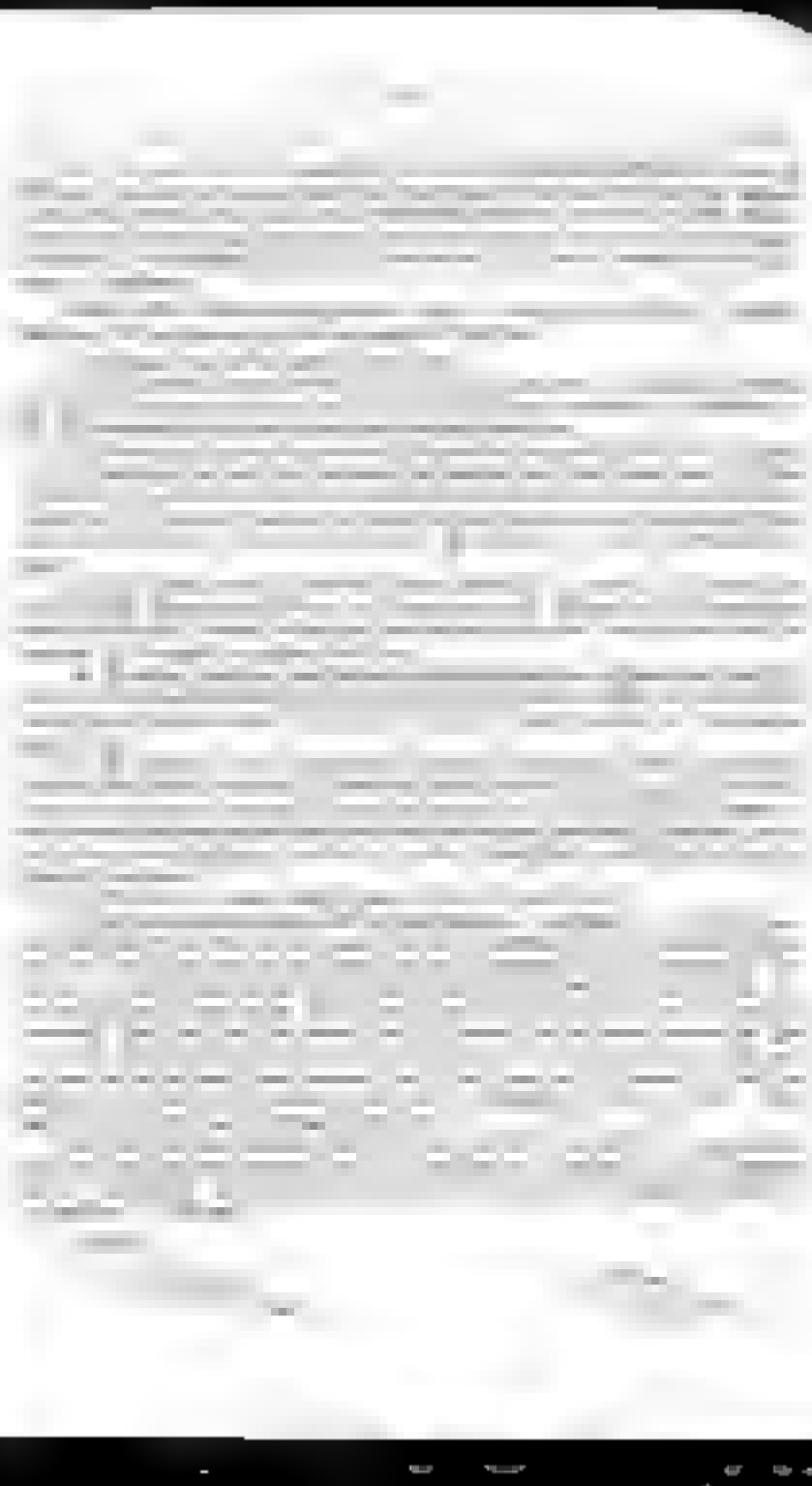


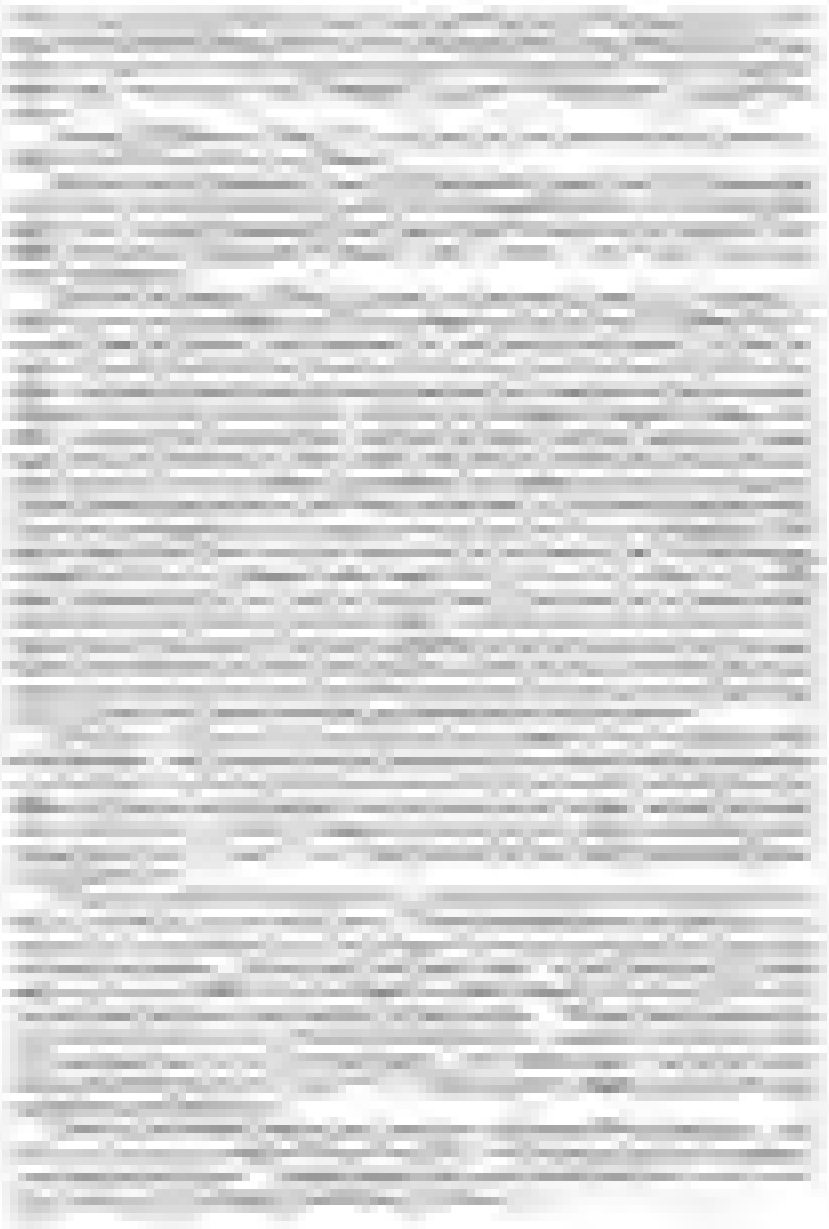


a ready sale. The time is near when the propagation of this variety of pine must enter largely into our forest management.

The visit of seven growth white pine just returned to line along the road that runs from Monroe through the Mulliman Township within and near the south-eastern boundary of the park. The soil was once cleared and used for farming purposes but was abandoned and is now overgrown with a thrifty crop of conifers. Had these lands been denuded by the process of farming, the resulting crop of trees would have been of a different kind. Pepper and pin cherries would probably have appeared in that case. The fire lights into the ground and destroys every hidden seed. Other seeds distributed by well known agencies are subsequently deposited on its new surface of which the poplar and wild cherry are the only ones that will germinate in the then unfruitful soil. (pp 117 8)



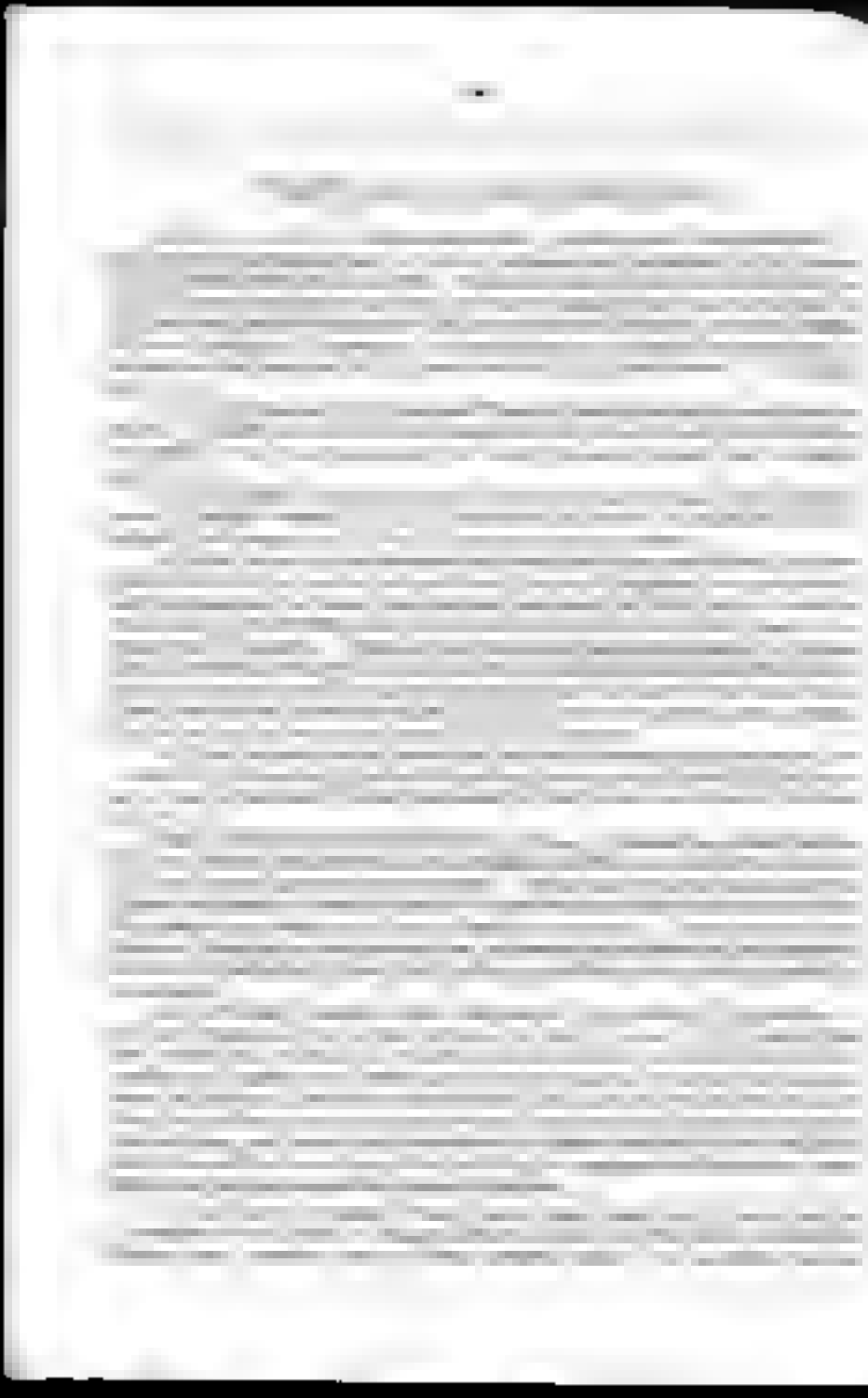


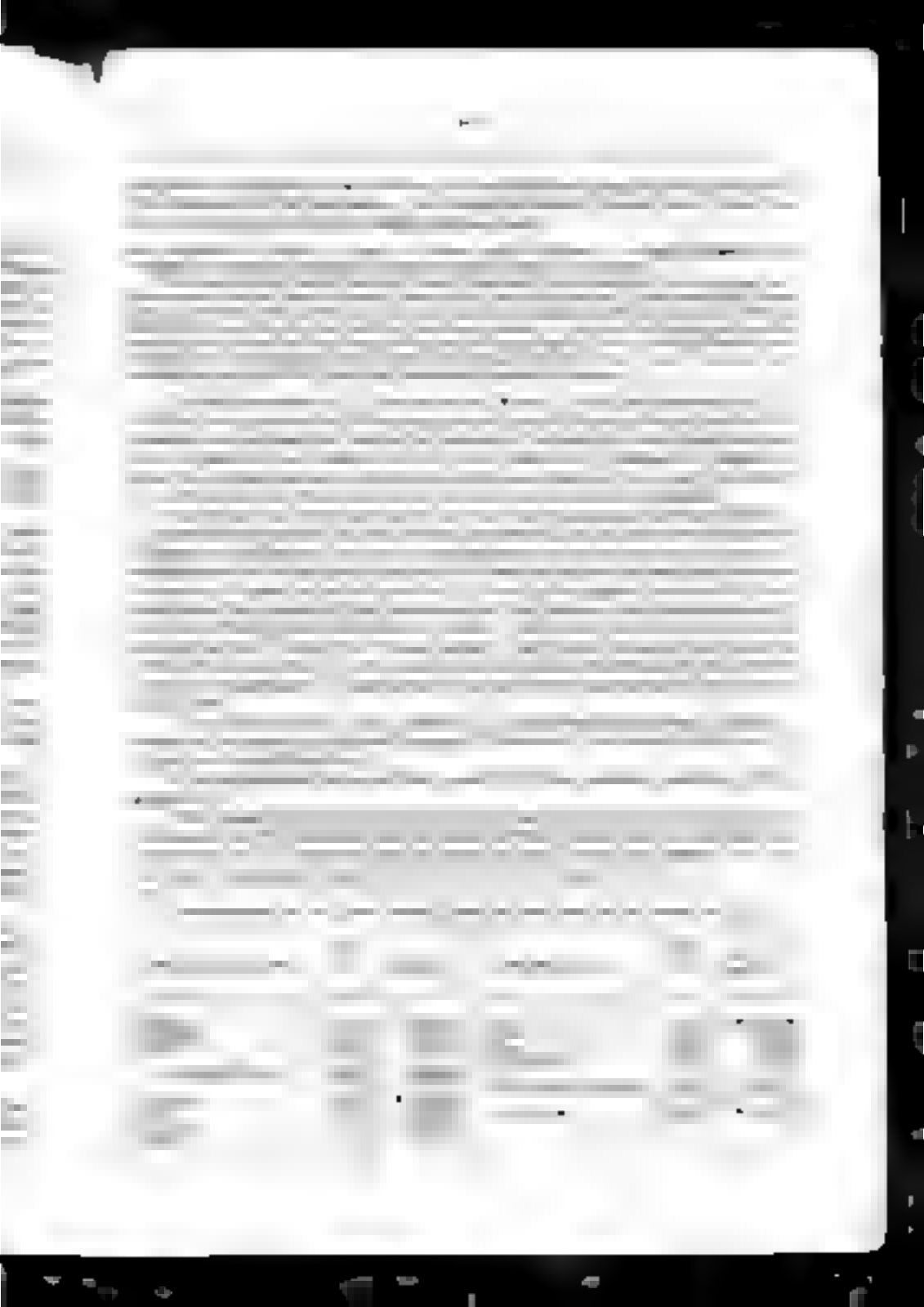


burning after the moneth of Marche quhir all parties be schorne, under the paine of fortie shillings to be raised to the lord of the land of the barnes, etc.

Subsequent acts were 10 James III. Chap. 76, Anno 1477; 4th James IV. Chap. 48; 5th James IV. Chap. 73; 6th James VI. Chap. 84.

There are also several British statutes regulating the time for making muir burns. The 6th George IV. proceeds thus: "And whereas the laws now in force in that part of Great Britain called Scotland for preventing muir-burnt in forbidden time are found defective and insufficient, whereby not only the game, but also many extensive woods and plantations have been destroyed for remedy whereof be it enacted by the authority aforesaid that no person or persons shall make muir burn, or set fire to any heath or muir in that part of Great Britain called Scotland from the last day of March to the first day of November in any year under the penalty of 40s lawful money of Great Britain, for the first offence, etc. This Act was amended by 13 George III. Chap. 54, sec. 8.





The [illegible] damage of these fires [illegible] to be sought in the destruction of the [illegible] the [illegible] of the forest [illegible] which the chance for [illegible] of [illegible] must be [illegible] forest [illegible]

[illegible] the following table prepared from reports of the [illegible] and the [illegible] to the public treasury [illegible] with which the [illegible] administration would [illegible] by [illegible]

[illegible] has the cases reported do not by any means cover all [illegible] agents [illegible] in question [illegible]

Depredations of the Public Timber [illegible] Eleven Years

Year	Estimated value of timber reported stolen. Market.	Stumpage.	[illegible]	[illegible]	[illegible]
	$	$	$	$	
1881	[illegible]	[illegible]	[illegible]	[illegible]	
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
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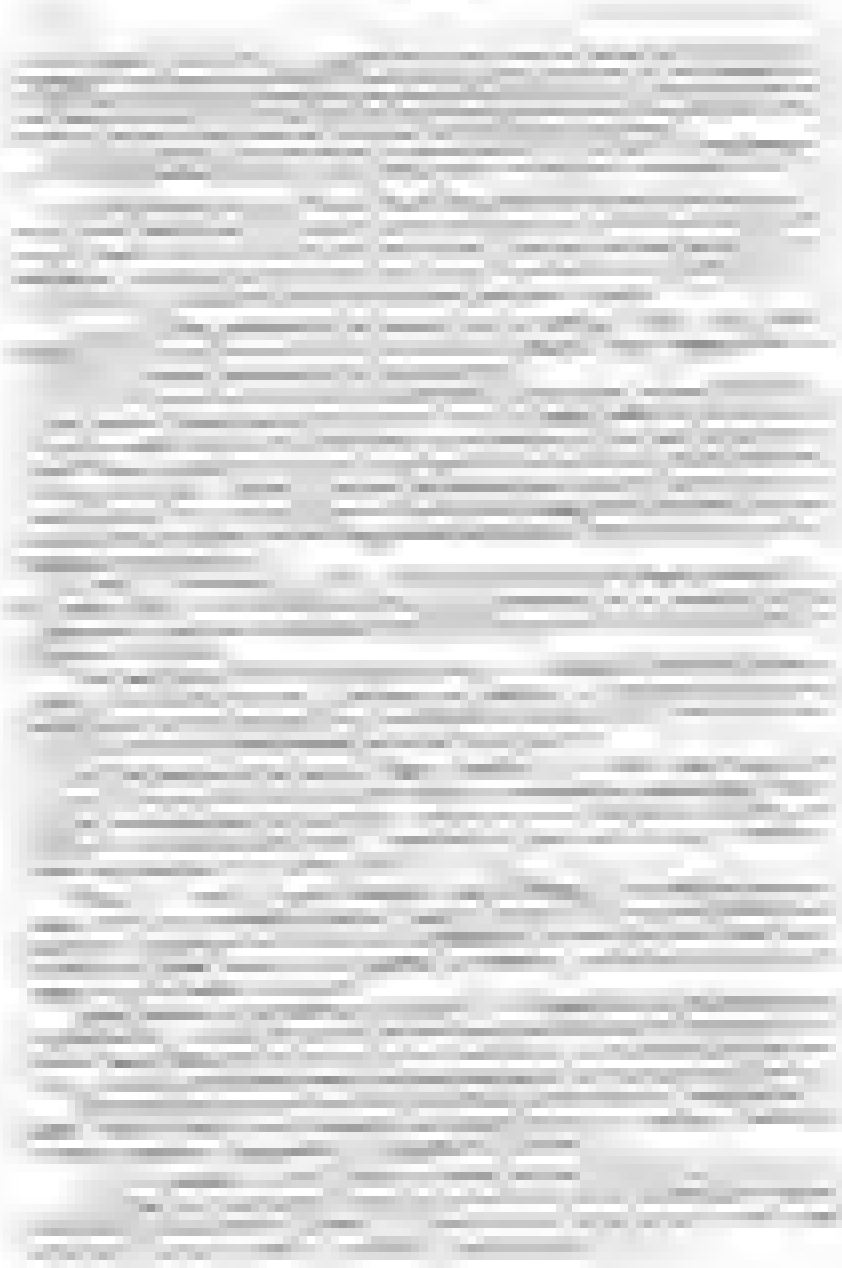
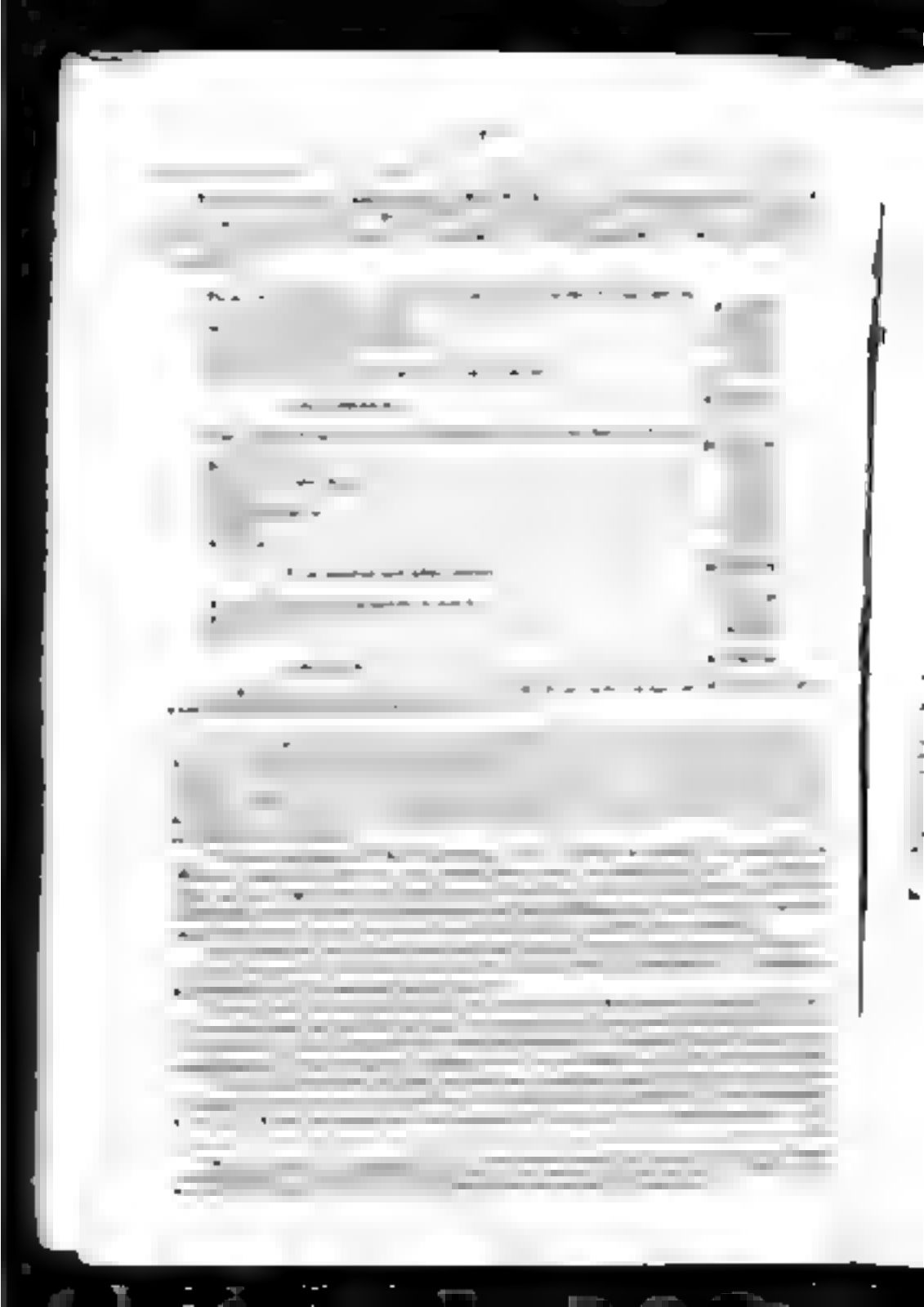
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1891	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Total	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

[illegible] by European [illegible]

The methods of management for [illegible] in Europe [illegible] view of [illegible]

Since in [illegible] managed forests only such species as are valuable are allowed [illegible]





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Ontario Royal Commission on
Forest Reservation and
National Parks

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PAPERS AND REPORTS

UPON

FORESTRY, FOREST SCHOOLS,

FOREST ADMINISTRATION AND MANAGEMENT

IN

EUROPE, AMERICA, AND THE BRITISH POSSESSIONS,

AND UPON

FORESTS AS PUBLIC PARKS AND SANITARY RESORTS.

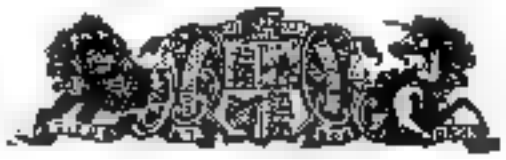
COLLECTED BY

MR. A. KIRKWOOD,

(Chief Officer of the Lands Branch of the Department of Crown Lands) under the direction of the Commissioner of Crown Lands.

TO ACCOMPANY THE REPORT OF THE ROYAL COMMISSION ON FOREST RESERVATION AND NATIONAL PARK.

PRINTED BY ORDER OF THE LEGISLATIVE ASSEMBLY



TORONTO
PRINTED BY WARWICK & SONS, 68 & 70 FRONT STREET WEST
1892.

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INTRODUCTION

"A great State was a desert, and the land
Lay bare and useless under sun and storm,
Treeless and shelterless. Spring came and went,
And came, but brought no joy; but, in its stead,
The desolation of the ravening floods,
That leaped like wolves or wild cats from the hills,
And spread destruction over fruitful farms
Devouring as they went the works of man,
And sweeping seaward Nature's kindly soils,
To choke the water-courses worse than waste.

"The forest trees, that in the olden time—
The people's glory and the poet's pride—
Tempered the air and guarded well the earth,
And, under spreading boughs, for ages kept
Great reservoirs to hold the snow and rain,
From which the moisture thro' the teeming year,
Flowed equably but freely—all were gone.
Their precious bales exchanged for petty cash,
The cash that melted and had left no sign
The logger and the lumberman were dead,
The axe had rusted out for lack of use
But all the endless evil they had done
Was manifested in the desert waste.

"Dead springs no longer sparkled in the sun
Lost and forgotten brooks no longer laughed
Deserted mills mourned all their moveless wheels
The snow no longer covered, as with wool,
Mountain and plain, but buried starving flocks
In Arctic drifts; in rivers and canals
The vessels rotted idly in the mud,
Until the spring flood bursed all their bones
Great cities that had thriven marvellously,
Before their source of thrift was swept away,
Faded and perished, as a plant will die
With water banished from its roots and leaves,
And men sat starving in their treeless waste,
Beside their treeless farms and empty marts,
And wondered at the ways of Providence!"

THE UTILITY OF FORESTS.*

cubic feet

Forests as Objects of Industry

one year to ninety-nine years old, and this is called the normal growing stock. Without the presence in the forest of this series of age gradations it would be impossible to obtain a regular annual yield of trees one hundred years old.

The subjoined table gives the capital invested in a forest worked upon the principle of a sustained annual yield. The data for the growing stock are taken from the Yield Tables for the Scotch Pine, by M. Weise converted into English measures. In calculating the value of the growing stock it has been assumed that fagots would not yield any money return, and that timber including all pieces of three inches diameter and upwards at the thin end would yield two pence per cubic foot under a rotation of thirty years, gradually rising to five pence per cubic foot under a rotation of one hundred and twenty years. Soil adapted for the growth of Scotch pines is generally light, and the value of such land of the I. or best quality cannot, on an average, be estimated at more than £25 per acre, while land of the III. or middling quality may be estimated at £12 per acre, and land of the V. or lowest quality at £4, though land of the latter quality is not worth more than a few shillings per acre.

CAPITAL INVESTED IN FORESTRY—POUNDS STERLING PER ACRE.

Length of rotation in years	I. Quality best.			III. Quality middling.			V. Quality lowest.		
	Land.	Growing stock.	Total.	Land.	Growing stock.	Total.	Land.	Growing stock.	Total.
	£	£	£	£	£	£	£	£	£
30.	25	3	28	12	2	14	4	1	5
40.	25	17	42	12	7	19	4	3	7
50.	25	26	51	12	13	24	4	5	9
60.	25	35	60	12	17	29	4	8	12
70.	25	45	70	12	22	34	4	11	15
80.	25	56	81	12	28	40	4	15	19
90.	25	68	93	12	35	47	4	20	24
100.	25	80	105	12	42	54			
110.	25	93	118	12	50	62			
120.	25	106	131	12	58	70			

(1). This table shows that the capital increases with the length of the rotation.

(2). That the value of the growing stock is at first smaller than the value of the land, equal to it under a rotation of from forty to fifty years, and greater after that period.

(3). That the capital invested in timber forests is considerably greater than that of the land only.

Precipitations or Rainfall.

The question whether and in how far forests affect the rainfall is one which has been a very much mooted for many years past but so far no final decision has been arrived at. That forests can affect precipitations arises from the facts that forest air is moist very much cooler than air in the open and that the trees mechanically affect the movement of the air; but on the other hand the rainfall depends chiefly on other much more powerful agencies in comparison with which the effect of forests is small. Numerous comparative observations have been made but only a certain portion has so far been published and unfortunately those which seem to indicate a decided effect of forests on the rainfall are not always very reliable. The great difficulty in ascertaining the results of observations at forest stations, that is to say stations situated inside a forest, with those of the ordinary meteorological stations consists in the fact that except in above the sea affects the rainfall most powerfully because air rises on rising and precipitations become more frequent with elevation.

Although further observations are necessary before a final conclusion can be arrived at, the following data may prove interesting:—

In the Prussian system the forest stations have shown the subjoined increase of rainfall over the average rainfall of the open country as taken from the ordinary meteorological stations

Excess of rainfall in forest station over that of open country in per cent. of the latter rainfall—

Between	328	feet and	656	feet elevation	1·25 per cent.
"	656	"	1,969	" "	14·2 "
"	1,969	"	2,297	" "	19. "
"	2,297	"	2,625	" "	43.

Although these figures may not represent the absolute facts of the case they seem to indicate that in the plains forests have very little effect upon the rainfall if any at all but that their influence becomes considerable with increasing elevation in mountainous countries.

The results of seven years observations made at two stations near Nancy show a decided increase of rainfall in the forest. The stations are situated 1,247 feet above the sea one in the middle of an extensive forest five miles to the west of Nancy the other in an almost woodless country six miles to the north-east of Nancy

The results were as follows

Increase of rainfall in forest over that in the open in per cent. of the latter—

February to April	7 per cent
May to July	13 "
August to October	23 "
November to January	21
Mean of year	16

Evaporation

Owing to the lower temperature the greater humidity of the air and the quieter state of the atmosphere evaporation must be considerably smaller in

Forests than in the open. This has been conclusively proved by direct observations. Those made in Bavaria and Prussia show the following results:

Stations.	Quantity of water evaporated from a free surface of water (height in inches).			Loss in forests as pressed in per cent of the total quantity evaporated in the open
	In the open.	In forest.	Less in forest.	
Bavarian	25 58	11 45	14 13	45
Prussian	13 16	5 98	7 18	55
Mean	18 84	7 28	11 05	59

These data show that evaporation in the forest was only two-fifths of that in the open country.

The effect of transpiration is that of the water which falls on the ground in a forest a considerably larger proportion is secured to the soil than in the open. That water is available to be taken up by the roots, while any balance goes to the ground water and helps to feed springs. Of considerable importance in this respect is the covering of forest soil. Dr. Ebermayer's observations on this point, extending over five years, show the following results:—

Water evaporated from soil in the open	100 parts
Evaporation from forest soil, without leaf mould	47 "
" " " with full layer of leaf mould	28 "

In other words, forest soil without leaf mould evaporated less than half the water in the open, while forest soil covered with a good layer of humus evaporated even less than one fourth of what evaporated in the open.

The result of these processes is that at any rate up to a certain elevation, the forest soil retains after a growing season much more water than open soil, although some 23 per cent of the rainfall are intercepted by the crowns of the trees. In order to illustrate this the following table, taken from Dr. Wessely's calculations is inserted as it shows the balance of rainfall over evaporation according to elevation. It is based upon Prussian observations.

Altitude of stations in feet.	Excess of rainfall over evaporation in inches.		Percentage of rainfall which evaporated	
	In the open.	In forest.	In the open.	In forest.
0— 328	13 02	5 83	55	67
328— 656	13 60	6 34	58	80
984—1,312	13 20	17 05	56	26
1,969—2,297	36 66	30 79	23	13
3,540	47 10	43 05	16	9
3,936	54 77	46 36	19	15

This table shows that the balance of water retained by the soil increases rapidly with slope and that the evaporation in mountain forests may be reduced by about 10 per cent of the rainfall. If it be remembered that the mountain forests are most effective in preserving forests it will readily be understood why the mountain forests have from time immemorial been looked upon as the preservers of moisture and feeders of springs. Some portion of the water is again taken out of the ground by the roots of the trees and evaporated through the leaves. The quantity thus evaporated is not known at present but it cannot be more than 12 inches, the total quantity available in dry and forests and pervious soil, together with the annual, or at a conservative balance remains available for forests for the feeding of springs.

Mechanical Effect of Forests

The mechanical effect of forests makes itself chiefly felt in regard to the distribution of the rain water, the preservation of the soil on hill grounds and the feeding of springs and the prevention of evaporation and the moderation of air currents.

(a) *Feeding of springs and rivers*

Most of the rain water falling on a bare slope rushes down and the poured water causes a comparatively short flow thus causing a rapid rise in the level of the stream. This is a common feature which the ground is not in a position available for the feeding of springs. If the rain falling over a forest area on the slopes is intercepted by the crowns of the trees and by dead shrubs, fallen leaves, a layer of humus which possesses a great capacity to absorb water and to retain it for a time. It has been shown by nature that humus of the species *Hypnum* which grows under the shade of conifers can absorb up to seven times its own weight of water and great masses of this plant which is preserved beneath wood can almost instantaneously absorb a rainfall of five inches. Part of the water thus absorbed penetrates into the ground and becomes available for the feeding of springs while the rest gradually finds its way in the nearest streams in this manner the forests must have a decided effect upon the maintenance of springs and the moderation of sudden floods in rivers. When heavy rain happens on such soil rapidly water and rain continues the effect of forests as regards flood moderation ceases because the soil becomes saturated with water and the water flows on the surface of gravity and finds its way into the streams.

(b) *Protection of the soil*

Water running down a bare slope possesses a great erosive power by means of which it carries away soil particles with it. In this way soil and stones are often caused to move and travel and fall in small streams at the foot of the slope. Such soil cannot be retained in position. Frequently the stones and rocks in streams and the obstruction which are met with in the course of the land are the result of soil erosion. The rate at which this process proceeds depends on the gradient of ground and the formation of the surface. Loose soil, dry soil and soil near the foreshore the greater will be the damage. On the other hand such a slope is covered with a well preserved forest the roots of the

[illegible] protected by cultivated fields

(c) *Protection against sea currents*

[illegible] depends often on that of woodlands.

Hygienic Effects of Forests

[illegible] swampiness, has yet to be proved.

[illegible]

must be determined on the special circumstances of each country. By way of illustration the areas at present under forest in a number of countries are shown in the following table:

Countries.	Area under forest, in acres.	Percentage of total area of country under forest.	Forest area per head of population, in acres.	Distribution of forest area, according to ownership, in percentage of total forest area.		
				State and crown forests.	Forests of communities, endowments, etc.	Private forests.
Servia	6,166,000	43	3·8			
Russia-in-Europe	537,427,000	42	6	60	40	
Sweden	42,366,000	42	9·1	20	80	
Austria proper	24,161,000	33	1·1	6	94	
Hungary	23,608,000	29	1·4	15	52	33
Germany	34,822,000	26	0·9	33	19	48
Norway	16,980,000	25	9·9	13	2	85
Turkey, including Bulgaria, Bosnia and Herzegovina	20,512,000	22	3·5			
Roumania	4,933,000	22	0			
Italy	14,220,000	23	·5	4	43	53
Switzerland	3,930,000	19	1	4	67	29
Spain	21,345,000	17	1·3	82		18
France	20,750,000	16	0	11	23	66
Greece	2,028,000	16	1·2	80		20
Belgium	1,073,000	16	0			
Holland	864,000	7	0			
Denmark	477,000	6	0			
Portugal	1,166,000	5	0			
Great Britain and Ireland.	3,790,000	4	0			
Total for Europe	766,824,000	21	2·5			
United States of N. America.	880,000,000	17	7·6			
East India, British.	140,000,000	25	0	50	50	

The percentage of forest area varies from 43 to 4, and the area per head of population from 9·9 to 1 acres. This shows that the general conditions in the various countries must make different demands in respect of afforestation. Servia, Russia, Sweden and Norway may as yet have more forests than they require for their own population. On the other hand Great Britain and Ireland, Portugal, Denmark, Holland, Belgium, and even France and Italy have a smaller forest

situated in respect of importation by sea

(a) The State or the Crown
(b) Corporations, endowments, etc
(c) Private persons

siderably decrease in the course of time

DEFORESTATION IN RUSSIA

neither be overlooked or gainsaid

question of life and death

devoured the woods

-p—we find th
-perial Society

but not nearly enough

they too late?

A PLEA FOR PLANTING

all. These woods were of all the usual

succeeded extremely well in every sort of soil

TREES FOR SHELTER

doubtless, one day be approximately known

which do not enjoy this indispensable protection

FORESTRY BYE-PRODUCTS*

It has been said that there is in the British Isles an immense area of land that either never has yielded or at the present time does not yield any agricultural rent, but which might become of value were capital invested in planting it with timber trees.

Though in common with other trades the British production of timber has been rendered far less remunerative than formerly by keen foreign competition, it can be shown that timber will yet, in many cases, yield a very fair return for capital.

The forest produce of Great Britain is mainly applied in the following ways:—

1. Ship and boat building, piers, bridges, etc., requiring much large and sound timber.
2. Building, scaffolding, etc.
3. Railway sleepers.
4. Pit props.
5. Fencing.
6. Furniture, mainly chairs of beech, yew, etc.
7. Hop poles and agricultural implements.
8. Bobbin wood.
9. Fagots and firewood.
10. Charcoal for gunpowder, pitch, etc.
11. Bark for tanning.

In the first four of these branches the produce of the forests of Scandinavia, for the present apparently inexhaustible, and at the very small rate of profit to the producers, has almost driven British timber out of the market. The rent charges on land, the cost of labour and of overland transit in Great Britain may be contributing causes to this result, but it is also apparently the fact that the sending of straight or heavy-shaped timber into the market by British foresters is another reason for the success of Scandinavian trade. The best means of meeting foreign competition is by looking to increased economy of production coupled with excellence of quality; and as in other trades, it is probable that the utilization of waste substances and by-products may prove the chief key to economical production. Hop poles, agricultural implements, and bobbin-wood are clearly among the most remunerative outlets for home produce, the main question with reference to them being economy of production and utilization of waste.

Though hops form a very uncertain and costly crop, the profits on hop-growing are so considerable that the extension of it could be considered by our farmers. Chemical substitutes for hops cannot be successfully used to the exclusion of the natural latter, whilst the vine could be used in the manufacture of textile products, or of paper. The Spanish chestnut, ash, and larch are largely grown for hop-poles in the south of England.

Ash is also in constant demand for the handles of ploughs, spades, axes, and other implements, and is like sycamore, the wood of which is considerably used by wheelwrights, a rapidly growing tree.

* By G. S. Boulger, F.L.S., F.G.S. London, in *Forestry and Forest Products*. Edinburgh: 1894.

more especially on poor gravelly land

quantities of coppice woods

Bark

depend on the chestnut oak for tanning purposes

higher proportion of tannin than that of the trunk

peels easily

kind

[illegible] the mineralogical laboratory

[illegible] able and more hygroscopic

[illegible] cubic inches of gas (CO_2) in the table :—

Willow (*Salix alba*)	77
[illegible]	[illegible]
[illegible]	[illegible]
Fir, chestnut, hazel	66

[illegible] and decolorising agent

[illegible]

[illegible]

[illegible]

Tar and Pitch

[illegible]

Baltic ports

[illegible]

drive off the volatile [illegible]

Turpentine, Resin, &c.

[illegible]

sylvestris), and from the south of France, under the name of

by M Guillemain from the resin from the Bordeaux area

Minor Products

species of orchid

Leaves, Sawdust E

The following table prepared in Bavaria exhibits the composition of the leaves or needles annually by an acre of forest under beech pine or spruce as compared with that of a ton of wheat straw —

	Dry matter	Ash	Nitrogen	Lime	Magnesia	Phosphoric acid	Potash
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
Beech, per acre of land	3,971	166.0	1.66	17.18	10.99	0.33	3.38
Pine, per acre of land	1,543	45.5	4.33	10.44	4.24	1.28	1.81
Spruce, per acre of land	4,963	121.3	4.38	21.82	4.38	0.72	1.67
Wheat straw per ton	2,240	66.7	9.00	5.38	2.38	1.49	8.41

Now that a use for forest litter for cows and horses and though less rich in manurial value being very deficient of liquid manure can when thoroughly soaked, be used as a valuable top dressing

For every if the forester has any waste that he cannot utilise in the tan pit or the charcoal retort as paper pulp is now produced it is profitable to turn it to account by converting resins and fungus to his own use. By this means the manurial value of the refuse and useless saplings may be retained as a valuable dressing for the grass and orchard or market gardens or even on other crops. The potash might even be recovered by lixiviation of the ashes and used for many purposes.

The Production of Wood Pulp.*

The wood pulp industry may be said to have commenced in the year 1845. But its development during the first thirty years was very slow. Since 1875 however the production of this material has increased rapidly. Its present importance is due entirely to the cheapness with which it can be manufactured. Originally in 1845 it was not manufactured commercially. Ground wood was first used for paper-making about 1867 or 1868 when it was manufactured by hand under a patent taken out in that year in the United States. Since that time many improvements have been made in the machinery and methods used in grinding the wood and in the subsequent treatment of the pulp. The former is now carried out by pressing the wood against a revolving grindstone in contact with water. No chemicals are used in the process which only requires the use of machinery for grinding the wood and a sufficient water power and suitable machinery.

Processes such as soda and sulphite have only been in use for preparing very fine grades of wood pulp for the last ten or fifteen years. One of the most prominent manufacturers of the Norwegian system was a poor farmer who began to make paper pulp in a very small way from pine wood and worked out the various details of the process himself. It has been found however that in this way the whole of the branches and needles are lost, which are very valuable for paper making purposes which it was necessary to pay a cut for straw and are now principally worked up in this way at the present time.

* By A. R. Cross, C. F. Cross and E. J. Bevan, in Forestry and Forest Products. Edinburgh. 1904.

Oak can also be used, though y g an inferior product that requires

nnations there need be absolutely no waste

The chemical preparation of fibre has given rise to two distinct processes—the soda process and the acid p

styled , ated pulp

white pine pulp

hitherto decided in favor of conifers of a certain s

matter and possesses no compensating advantages

birch

Hemlock Extract

countries in the manufacture of leather

ing, etc

worth in Boston $20 a barrel

it available for tanning or extract purposes

one-sixth of the time, and at one-half of the cost

exportation

cord for felling and $1 per cord for carting

mms are represented. Dr. Bell says

rt oak and cottonwood

than elsewhere

regions

Forest trees east of the Rocky Mountains may be divided into four groups, as regards their geographical distribution within the Dominion.

1. A northern group, including the white and black spruces, larch, Banksian pine, balsam fir, aspen, balsam poplar, canoe birch, willows and alder. These cover the vast territory down to about the line of the white pine.

2. A central group of about forty species occupying a belt of country from the white pine line to that of the buttonwood.

3. A southern group, embracing the buttonwood, black walnut, the hickories, chestnut, cucumber tree, prickly ash, sour gum, sassafras, and flowering dogwood, which are found only in a small area in the southern part of Ontario.

4. A western group, consisting of the ash leaved maple, burr oak, cottonwood, and green ash, which are scattered sparingly over the prairie and wooded regions west of Red River, and Lake Winnipeg.

In the western peninsula of Ontario the forests present a remarkable richness in the number of species to be found growing together. In some localities as many as fifty different kinds may be counted on a single farm lot. A more varied mixture is probably not to be met with in any other part of the continent, or perhaps in the world.

LEVELS OF THE OTTAWA

The following tables from the reports of the Geological Survey (Canada show the levels at various points on the St Lawrence, Ottawa and Matawa rivers, from Three Rivers to Lake Nipissing.

Levels of the Ottawa above the waters of the St Lawrence at Three Rivers, which is about the highest point affected by the action of the tides —

	Distance miles.	Rise. ft. & in.	Total rise. ft. & in.	
Rise from Three Rivers to Montreal harbour as stated in a report of the Hon. H H Killaly. President of the Board of Works in 1845	90	12 9	12 9	Montreal.
Rise from Montreal harbour to lake St Louis at Lachine, from the same report				
1 lock	12.3			
2 "	13 8			
3 "	8 6			
4 "	9 0			
5 "	9 9			
	10	44 0	57 6	Lachine
Rise in lake St Louis from Lachine to Ste Anne	13	0 6	58 0	
Rise in the lock at Ste. Anne		3 0	61 0	
Rise in the lake of Two Mountains from Ste Anne to Carillon	28	0 6	61 6	Carillon.
Rise from Carillon to Blondeau				
1 lock, up	10 0			
2 "	11 0			
	21			
3 lock down	12	4½	6 0	
Rise in Chats lake Blondeau			69 6	
Rise in the Grenville canal from the head of Blondeau to the head of Grenville canal			73 6	
1 lock	3 0			
2 "	3			
3 "	3			
4 "	3			
5 "	7			
6 "	6	34	33 0	106.0 Grenville.
Rise in the navigable part of the Ottawa, between Grenville and the entrance to the Rideau canal		58½	9 6	115.6 Ottawa.
Rise from the entrance of the Rideau canal to the Chaudière lake, viz Rise in the Rideau canal to Dow's Swamp				
1 lock	11.0			
2 "	11.0			
3 "	10			
4 "	11.0			
5 "	10			
6 "	10			
7 "	10			
8 "	10			
	81			
Fall from Dow's Swamp to Chaudière lake	8	6	63 0	181.0 Chaudière.
Rise in Chaudière lake from the foot to Fitzroy harbour at the head supposed to be one inch per mile.	25	2	183 1	
Rise from Fitzroy harbour to Chats lake, as ascertained by levels taken up the Mississippi channel by the Board of Works in 1845, 49 98, say	9	50.0	233	Chats.
Rise in Chats lake from the head of the Rapides des Chats to the foot of the Chenaux supposed to be one inch per mile	15	1 3	234 4	

Levels of the Ottawa above the waters of the St. Lawrence at Three Rivers.—*Continued*

	Reference Number.	Rise. Ft. In.	Total rise Ft. In.	
Rise from the head of the Chaudière to Portage du Fort	5	5 0	220 4	Portage du Fort.
Rise to the head of Portage du Fort		0	225 4	
Rise from the head of Portage du Fort to the head of the Calumet rapids, by the way	1	5 0	230 4	
Rise to the head of the Calumet rapids, by the way	1½	4 1	234 5	Calumet.
Rise to the head of the Calumet rapids, by the way	1½	1 0	235 5	
Rise from the head of the Calumet rapids to the head of the Mountain		13 0	248 5	Mountain.
Rise from the head of the Mountain to the head of the Chats	1	6 5	254 10	
Rise to the head of the Chats		5 0	259 10	Chats.
Rise from the head of the Chats to the head of the Rocher Fendu, by the way	1½	5 10	265 8	
Rise from the head of the Rocher Fendu to the head of the Chaudière, by the way	1	65 8	330 16	Chaudière.
Rise from the head of the Chaudière to the head of the Deschênes rapids, by the way	1½	6 8	337 4	
Rise from the head of the Deschênes rapids to the head of the Petite Nation rapids, by the way	1	2 0	339 4	Petite Nation.
Rise from the head of the Petite Nation rapids to the head of the Black river, by the way	1	5	339 9	Black river.
Rise from the head of the Black river to the head of the Chenaux, by the way	1	3 0	342 9	
Rise to the head of the Chenaux		2 0	344 9	Chenaux.
Rise from the head of the Chenaux to the head of the Allumettes, by the way	1	2 6	347 10	
Rise from the head of the Allumettes to the head of the Lake of Two Mountains, by the way		29 7	377 5	Allumettes and Lake Allumettes.
Rise from the head of the Lake of Two Mountains to the head of the Rapid Plat, by the way	22	5 4	382 9	Deschenes.
Rise from the head of the Rapid Plat to the head of the Long Sault, by the way	1	10 2	392 11	
Rise from the head of the Long Sault to the head of the Carillon rapids, by the way	1	1 0	393 11	Rapid Plat.
Rise from the head of the Carillon rapids to the head of the Grenadier island rapids, by the way	1½	1 0	394 11	Long Sault.
Rise from the head of the Grenadier island rapids to the head of the Split rock rapids, by the way	1	2 4	396 3	Carillon.
Rise from the head of the Split rock rapids to the head of the Long Sault rapids, by the way	1	3	396 6	Grenadier island.
Rise to the head of the Long Sault rapids	2	43 10	440 4	Split rock.
Rise from the head of Roche Fendu to the head of the Chaudière, by the way	1½	2 9	442 1	Long Sault.
				Roche Fendu.
				Chaudière.

Levels of the Ottawa above the waters of the St Lawrence at Three Rivers.—*Continued*

	Distance. miles.	Rise. ft. & in.	Total rise. ft. & in.	
Rise from the foot of the Deux Rivieres rapid to the head of the Levier rapid, viz. Difference of level between smooth water at the foot and smooth water at the head of the Deux Rivieres Portage 12 33 Difference of level between the heads of the Deux Rivieres Portage and the mouth of the Magamikipi 8 36 Difference of level between the mouth of the Magamikipi and the head of the Levier rapid 8 09	3	20 4	505 5	Levier
Rise from the head of the Levier to the foot of the Mattawa rapids, being swift water nearly the whole distance, supposed to be 6 inches per mile	18	9.0	514.5	
Rise from the foot of the Mattawa rapids to the mouth of the Mattawa river	1½	5.0	519 5	Mattawa.
Rise from the mouth of the Mattawa to the foot of the Cave rapid, a considerable current about mid-way up, say 4 inches per mile	2½	0 10	520.3	Cave.
Rise from the foot of the Cave to the head of the Chaudron rapid viz. Rise in the cave 5 76 Rise in the Chaudron 6.00	¾	11 9	532 0	Chaudron.
Rise from the head of the Chaudron to the foot of the Erables rapid, say 9½ inches per mile	3½	1 0	533 0	
Rise from the foot to the head of the Erables rapid	½	13 0	546.0	Erables.
Rise from the head of the Erables to the foot of the Mountain rapid, say 8½ inches per mile	3½	1 0	547.0	
Rise from the foot to the head of the Mountain rapid	½	5 5	552 5	Mountain
Rise in the Seven Leagues lake from the head of the Mountain rapid to the foot of the Long Sault rapids, say 2½ inches per mile	17	3.6	555 1	
Rise from the foot to the head of the Long Sault rapids 1st or lower leap 6 92 Intermediate ¼ mile 2 50 2nd leap 6 16 Intermediate 1 3-4 mile 2 20 3rd Crooked rapid 6.38 Intermediate 1 2-3 mile 0 25 4th leap 16.82 5th upper rapid 9.34	6	48 5	604.4	Long Sault.
Rise from the head of Long Sault rapids to the mouth of the Opimika river above the Galops current; there is a perceptible current only in two places, say 3 inches per mile	12	3.0	607 4	Galops.
Rise from the mouth of the Opimika river to the head of lake Temiscaming, say 1 inch per mile.	25	4 8	612.0	Temiscaming.
Miles	492½			

Levels of the Mattawa from its junction with the Ottawa, 519 feet 5 inches above the surface of the St. Lawrence at Three Rivers, to Trout or Turtle Lake.

	Miles.	Feet and inches.	Total.	
Height above Three Rivers			519 5	
Rise from the mouth of the Mattawa to the foot of Plain Chant rapids, ascending a rise of 1 foot 8 inches in 3 small rapids, allowing 4 inches per mile	2½	3 6	522 1	
Rise from foot to head of Plain Chant rapids				
1 rise		5 6		
2		60		
	1	17 7	599 8	Plain Chant.
Rise in going lake from the head of Plain Chant rapids to the foot of Portage à la Rose, say 5 inches per mile	5½	1 4	540 10	
Rise from the foot of Portage à la Rose to the head of Portage du Rocher inclusive Amable du Fond river:				
1 Portage à la Rose rise		5 80		
Intermediate		20		
2 Portage de la Compagnie		5 80		
Intermediate		0 40		
3 Portage du Rocher		5 00		
	2	17 9	558 7	Du Rocher.
Rise from the head of Portage du Rocher to Rocher on the foot of Portage des Parresseux, say 3 inches per mile in addition to a small fall of 4 inches	3½	1 3	559 8	
Rise from the foot of Portage des Parresseux to the foot of the Talon or Haag falls				
1 Portage des Parresseux rise		33 3		
Intermediate		0 25		
2 Portage de la Prairie rise		8 55		
Intermediate		0 90		
3 Portage rise		6 30		
Intermediate		0 0		
4 Portage rise		3 31		
Intermediate		0 33		
	2¼	58 9	613 6	Foot of Talon.
Rise from the foot of Talon or Haag falls to the foot of Talon lake				
1 Portage de Talon rise		42 23		
Intermediate		0 25		
2 Portage rise		0 85		
	3	43 4	656 10	
Rise from the foot to the head of lake Talon by half old canoe route, say 1 inch per mile	7	0 7	657 5	Lake Talon.
Rise from the head of lake Talon to the foot of Lower Trout lake, the difference of level ascertained by the new canoe route, the distance by the old route, viz				
Rise from lake Talon to Lac des Pins		43 8		
Fall from Lac des Pins to Lower Trout lake		10 88		
	4½	5 3	688 8	Lower Trout lake.
Rise from Lower to Upper Trout lake say 1 inch per mile in addition to a rise of 2 at the mouth of the Upper lake	5½	1 4	690 0	
Rise from foot to head of Upper Trout lake	8	0 0	690 0	Upper Trout lake.
	29½			
Levels from the surface of Upper Trout lake, 690 feet above the waters of the St. Lawrence at Three Rivers, to the surface of lake Nipissing				
Height of Upper Trout lake			690 0	
Rise from Trout lake to the height of land between it and the Vase river on the same Portage	1	24 5	714.5	Height of land.
Fall from the height of land to the Riviere à la Vase, at the end of the Portage	1	22 5	692 0	Vase.
Fall from Trout lake Portage, on the Vase, to lake Nipissing				
Fall at 1st Portage		2 14		
Intermediate		1 00		
Fall at 2nd Portage		20 88		
Intermediate		1 50		
	4½	26 6	665.6	Nipissing.

Levels from the surface of Lake Nipissing, 665 feet above the waters of the St Lawrence at Three Rivers, to that of Lake Huron, at the mouth of the French River

	Miles.	Feet.	Total rise.
Height of lake Nipissing agreeably to the estimate of Mr. Wm. Hawkins in his report to the Commissioners of the lake Huron and Ottawa Survey in 1838, the falls on the French river are			665.0
1 Chaudiere falls (upper 10 0			
2 Chaudiere " (lower) 15 0			
3 Rapids 3 0			
4 " 9 6			
5 " 3 6			
6 " 8.0			
7 " 2 0			
8 " 5.0			
9 " 6 0			
10 " 3 0		68.6	
Allowance for the supposed general slope of intermediate parts of the river, say 6 inches per mile	55	27 6	84.0
To the level of lake Huron			68 0
The ascertained height of the surface of lake Huron above the sea, according to the Michigan Survey are as			578.0
Making a difference of			3 0

FRESH-WATER FISH

follows

and proper management of these forests

remaining fish

[illegible]

[illegible] ficial to the fish

[illegible] forests

[illegible] the health of the fishes

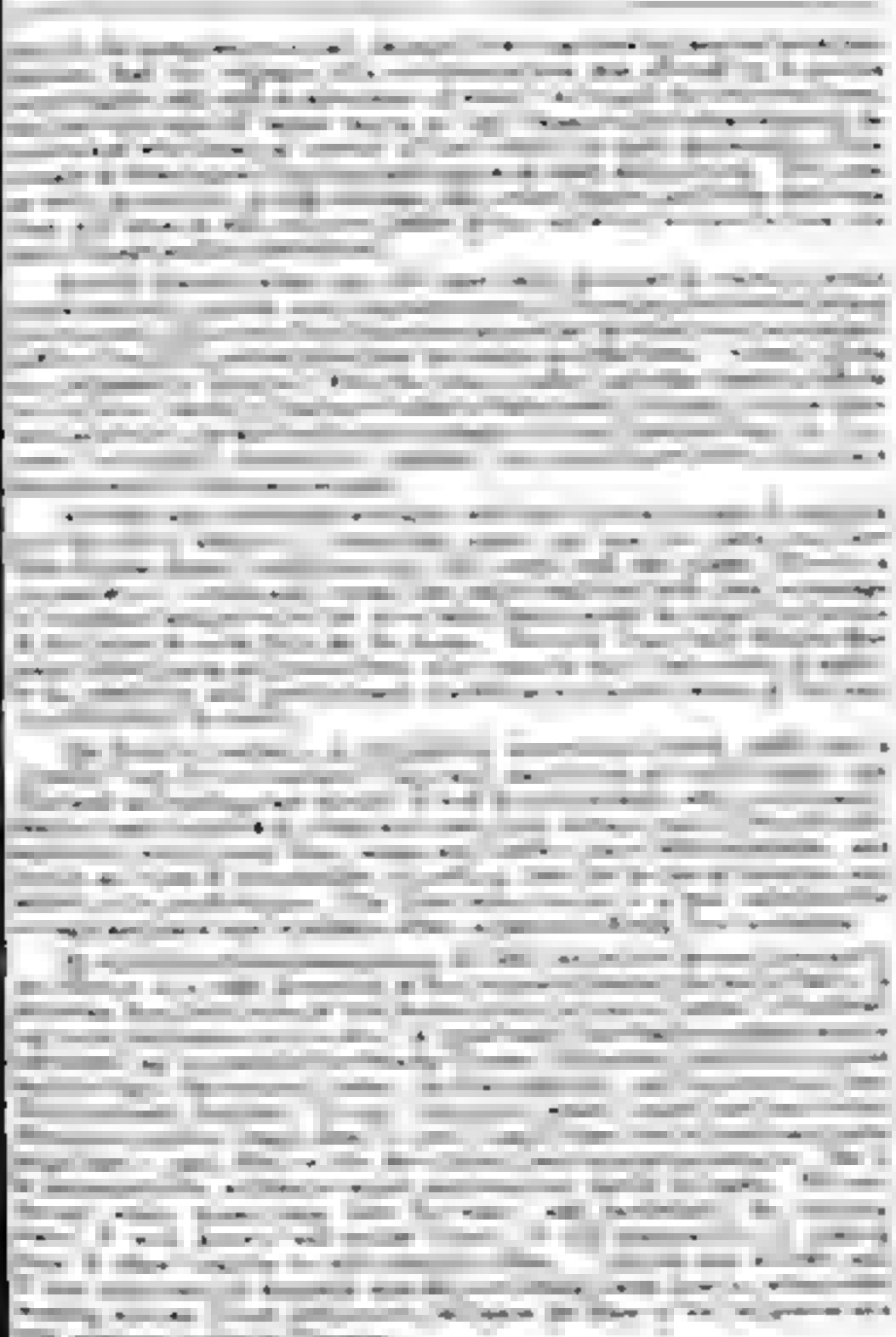
[illegible]

[illegible] vinced of this

[illegible] was above the woodwork

[illegible]

afe and food for fish.



The yearly consumption of osiers in England is far greater than the national supply and as the basket industry is constantly on the increase, it would also on this account be advisable to further the cultivation of the osier willows. For light, sandy banks, the best willow should be *Salix purpurea* and as it is so easily propagated, it will well repay the cost of cultivation, besides binding the banks, making them firm and adding to the beauty of the locality as well as that of the water. For more clayey soil, *S. viminalis* and the more celebrated *S. caprea* so much sought for powder factories, should be the best. The cuttings must be taken from the one to two-year-old shoots, and be put 1 to 1½ foot apart, in double or treble rows 2 to 3 feet apart, care being taken to leave only half an inch or less above ground.

There are many localities where comparatively valueless sand, close to the mouths of rivers and canals, might be made highly profitable, at the same time as the cultivation of it with the before mentioned trees and plants would improve the state of the fishing, and, before placing spawn and fish in any water I consider it important to pay great attention to this question. Where few or no trees exist it will be necessary to cultivate them, and I feel certain that such proceeding will enhance the chances of the success of pisciculture. I will not here enter further upon the practical details of the question. These are bound to vary with the locality, and the local foresters will know how to deal with them.

In drawing the attention of the conference to this question it is with the sincere hope that it may enlist your sympathy, and that the public opinion may be won for it. That it is important for all fresh-water fishing is evident. That is one more reason added to the many why we should regard the forest as a precious heirloom to be deeply revered, properly used and through careful maintenance, descend improved and enriched to posterity.

SYSTEMATIC MANAGEMENT OF FORESTS.*

The Model Forest

ng the standing stock

practice

ordinary money transactions

The Revolution

technical

Choice of a Revolution

obligations to themselves and posterity

surprise

Natural Regeneration of Woods.*

This is one of the essential objects of the science and art of sylviculture. Thus in the different kinds of high forest reproduction is obtained from seed shed by the trees themselves, [illegible] coppice with standards is regenerated [illegible] obtained just as naturally by means of the stools principally and secondarily by means of the seeds furnished by the standards.

But whatever the precautions taken in both descriptions of forest there are often spots where seedlings do not come up or where shoots die and vanish. At other times it may happen that the forest is found not to contain a sufficient proportion of a given species the share of which is necessary, or that this species has disappeared owing to an error in treatment or the total absence of [illegible]. In each of these different cases recourse must be had to artificial means in order to restore the good condition of the forest or a satisfactory composition of the crops. But such means ought to be the exception, not the rule. It costs more money and takes the place of natural methods. [illegible] natural regeneration [illegible] return to the infancy of the art. It is certain that [illegible] the forces of nature [illegible] the best results in the end at costs which are at the least desirable.

Nevertheless artificial restocking cannot be entirely prevented. It forms the necessary complement of natural regeneration but it must remain only its complement. Hence it is necessary for the forester to know both [illegible] well the various methods of stocking by artificial means [illegible].

Regeneration by Seed.*

Regeneration by seed is preferable [illegible] species that by shoots and suckers [illegible] species, since the power of reproduction of [illegible] is [illegible] for [illegible] purposes.

Under natural regeneration by seed is understood the formation of a new wood by the natural fall of seed, which germinates and develops into a crop of seedlings. The trees which bear the seed are called the mother trees; they may either stand on the area which is to be restocked, or on adjoining ground. A distinction is made between—

(1) Natural regeneration under shelter-woods.

(2) Natural regeneration from adjoining woods.

In natural regeneration under shelter-woods the area is stocked with seed-bearing trees and the new generation springs up under their shelter; for some time at any rate the area bears the new crop and part of the old one.

The system is that which occurs in primeval forests. When a tree falls from old age or other causes and an opening is thus formed in the cover overhead, the seed falling from the adjoining trees germinates and develops into seedlings; these grow up under the shelter of the older trees, and in their turn become mother and shelter trees. In this manner primeval forests, if undisturbed, go on regenerating themselves for generations. The process is a slow one, as the young crop will only develop when sufficient light is admitted by the fall or death of the old trees. In sylviculture it is accelerated by the artificial removal of a

* Schlich: A Manual of Forestry.

(1) *The selection system*

(2) *The group system*

(3) *The compartment system*

(4) *The strip system*

In each of these there are certain

good for all.

Choice Between Direct Sowing and Planting

planting than direct sowing is done

methods as preferable under a given set of conditions

pecially when these are raised under a shelter-wood

planting but the outlay is considerably smaller. It must however not be overlooked that in the majority of cases natural regeneration requires much time, as long as the shelter trees increase sufficiently in size and quality so as to make up for any loss on this account no harm is done, but where this is not the case artificial regeneration may be actually more profitable.

Damage by frost, drought, and weed growth is avoided or at any rate considerably reduced. The same may be said as regards damage by insects, though perhaps not to an equal extent.

Summing Up

Neither the artificial nor the natural method of regeneration is the best at all times and under any circumstances; only a consideration of the local conditions can lead to a sound decision as to which is preferable in a given case. In forming such a decision the forester must chiefly take the following points into consideration:—

(a.) General objects of management.

(b.) Species to be grown.

(c.) Condition of locality.

(d.) Available funds.

(e.) Skill and capacity of the staff.

Labor Required in Forestry

Forests require labor in a great variety of ways, which may be brought under the following three headings —

(1) General administration, creation, tending, harvesting, etc., or work done in the forest.

(2) Transport of produce.

(3) Industries which depend on forests for their prime material.

(1) *General Administration.* The quantity of labor required in the forests differs considerably according to circumstances, the value of the produce, and the consequent degree of the minuteness of the system of management. Great difficulty is experienced in obtaining accurate statistics on this point, but five days' work annually for every acre of land under forest may be accepted as an approximate estimate all round. From the available data it has been calculated that in the forests of Germany about $39,000,000 are paid annually for administration, creation, preservation, road making, cutting of wood, and collection of minor forest produce, on which about 200,000 families exist, or about 1,000,000 people. This estimate refers to forests which are already in existence, and in which fencing is done only in very rare instances. When new forests are created, additional labor is required at the outset. Nevertheless it is beyond doubt that forests require considerably less labour than land under field crops.

(2) *Transport of produce.* Owing to the bulky nature of forest produce its transport forms a business of considerable magnitude. Timber and firewood are carried by water wherever practicable, but also extensively overland. Under this head the sum of at least $19,480,000 is paid annually in Germany.

(3) *Forest industries.* The labour which is required to work up the raw material produced by forests is of a much greater extent than that employed in managing the forests and in transport. There are the workmen employed in

forests

Organization of the Personnel.*

consists of (1 guards and (2) rangers.

fading

passed by him before payment is made

[illegible] that the general provisions of the sanctioned [illegible] are properly carried out and [illegible] the accounts of the [illegible] officers.

[illegible] Commissioner has general control of several [illegible] of the State [illegible] Hence the [illegible] adviser of government [illegible] forest matters [illegible] in this respect [illegible] of State and [illegible] has his headquarters at the seat of Government.

[illegible] Inspector General stands in the same relation [illegible] government [illegible]

It [illegible] that by this system [illegible] and [illegible] officers of [illegible].

Members of [illegible] establishment [illegible] the higher [illegible] generally unfitted for the higher appointments.

The size of ranges [illegible] than where there was [illegible] forest [illegible]

CHOICE OF AN ORGANIZER

[illegible] the [illegible] officer who has been in immediate charge of the forest [illegible] a [illegible] of a plan or [illegible] whose sole business is to prepare plans of management?

[illegible] Of course it is one which [illegible] large tracts of forest [illegible] the State [illegible] A small [illegible] keep a special staff fully employed.

It has been urged in favor of the [illegible] conducting the organization and [illegible] of a forest that [illegible] than other [illegible] take much more interest in the carrying out of his own programme than that of another.

On the other hand it has been maintained that the special [illegible] necessary to organize a forest [illegible] than a few [illegible] that [illegible] practice a special branch would attain the necessary [illegible] it is more likely to

always there to assist and advise the organ ser

one head

the revisions in person

tion department at Munich

FORESTRY IN THE COLONIES AND IN INDIA *

A circular containing questions relating to colonial timber was addressed by the Secretary of State for the Colonies to the administrative heads of the various British possessions in 1874, from the replies to which it appears that in none of the six Provinces of the Dominion had measures been taken to secure the replanting of cleared areas, or the afforestation by natural reproduction notwithstanding an enormous and growing consumption

In the Province of Ontario more than 87½ per cent of the timber annually cut was exported and, looking to the magnitude of the timber exports, it was remarkable that so little had been done to prevent the threatened exhaustion of the chief article of trade in the Province.

In Nova Scotia the amount of timber annually cut was estimated to exceed by 25 per cent the amount which could be cut each year without permanent injury to the forests, while in Prince Edward Island the amount annually cut exceeded nearly seventeen times the quantity which would represent a prudent rate of consumption.

The timber resources of British Columbia were declared by local authorities to be practically inexhaustible, but it is probable that, should the whole strain of the demand be thrown upon British Columbia, a few years would make a very perceptible inroad upon the stock of native timber situated in accessible districts of the Province

The importance of this trade to the commercial prosperity of the Dominion will be exemplified by the following table, compiled from materials contained in returns issued by the Board of Trade.

Comparative tables of money values of timber and corn (grain) exported to the United Kingdom during five years ending 1876.

Articles.	Value.					
	1872	1873	1874	1875	1876	Total.
	$	$	$	$	$	$
Timber and wood	4,219,861	5,230,296	5,705,567	4,305,045	5,363,877	24,833,226
Corn and grain	3,008,.04	3,898,304	3,637 616	2,134,056	2,614,003	16,536,983

Timber and corn (grain) are the chief exports of the Provinces of the Dominion, but the value of the timber exports exceeded the value of the corn exports by more than one-third and constituted nearly one-half of the total value of all the exports from the Dominion to the United Kingdom

The returns exhibit, in a striking manner the urgent need for some prompt and comprehensive action to stay the influences at work to destroy the indigenous forests, which constitute, in many instances, the principal natural riches of the colonies. There is a tendency in newly-settled countries to regard the timber as

* Selkirk In Proceedings of Royal Colonial Institute, vol. xii., 1880-90.

favour with settlers

New Zealand

aken, there would not be a Kauri tree in the colony in the next

from." The preamble recites that "it is expedient to make

aside pastoral leases or licenses over lands so selected

Prescribing the duties of officers

To regulate the form and issue of licenses

To control the management of the forests

To prevent waste and unnecessary destruction

To prevent the danger and spread of fire

To prohibit trespass and regulate access

of money recoverable as penalties.

of the air

the equatorial regions, the great reservoir of moisture

others, for the following matters

(1) The formation of State forests

(2) The formation of timber res[illegible]

(3) The management of both

[illegible] duce on the [illegible]

The timber reserves are, therefore, only temporary reserves [illegible]

law or any regulations issued under it [illegible]

the colony, as existing in 1887

[illegible]

Timber reserves	...690.732 "
Total	1,355.442 acres

[illegible]

as often as not, left trees to rot where they had fallen, witho[illegible]

left outside, and inferior growth taken up for the

for props, laths, etc., is very inferior and immature

not included in the reserve State fo

the Victorian Forest Department

aged and efficiently protected

as the reserved State forests

themselves easily enough

appear faster than

India and in most of the Colonies.

their action to nominal measures

greatest breadth is about 1,000 miles having east of mean latitude in the north central territory of Upper Burma. The area and population stated as follows :—

	Area in square miles	Population	Per square mile
British Territory without Upper Burma.	912,000	300,000,000	231
[illegible]	[illegible]	[illegible]	[illegible]
Total	1,[illegible]	[illegible]	[illegible]

The physical configuration is very peculiar. The country consists of three great units viz.

(1) The Himalayas

(2) The Indo-Gangetic Plain

3) The Peninsula

The Himalayan ranges stand out like a high wall in the north separating India from the Tibetan high plateau. The great bend (range of peaks running along the southern slope of the Himalayas from West to the west to the East of Assam in the east. The south of this wall and part is surrounded by the Arabian Sea on the west and the Bay of Bengal on the east. The mountains which are in the territories are greater than [illegible] and a part of the [illegible] Mountains reach a height of [illegible] feet and [illegible] of Himalayas at the foot of the hills rises to [illegible] feet above sea level. Further south there is an increase again when the peninsula [illegible] a height ranging between two thousand and eight thousand feet.

Another peculiar fact is that India receives the drainage of both slopes of the Himalayas which ultimately empties into the three great rivers in the Brahmaputra and Ganges. The first two rise in close [illegible] south west of the Himalayas and flow in the west and the east of the Arabian Sea and the latter through Assam and Bengal in the Bay of Bengal. The Ganges drains the greater part of the southern slope of the Himalayas from Nepal and also receives the Brahmaputra in the Bay of Bengal. The largest part of the peninsula is situated on a [illegible] plateau of about [illegible] feet. The greater part of the [illegible] in the part of the country [illegible] the Bay of Bengal.

It may be easily understood that a country like India must have different climates and [illegible] a matter of fact this ranges from the [illegible] to the wettest [illegible] coast of the country in Assam to Punjab and Rajputana and again [illegible] the hottest in an area [illegible] and [illegible] of the Himalayas. Of these [illegible] the following [illegible] may be mentioned as most characteristic.

1. The climate of temperate [illegible] Himalayas [illegible] the [illegible] and [illegible] the [illegible] of the mountains [illegible] cold temperature. There is [illegible] and heavy

2. The climate of North western India [illegible] the highest summer temperature though the average temperature of the year is lower than in the

when the climate resembles that of South Italy

the relatively large quantities of moisture in the

moderate heat in summer

owing to a rise or fall of the surface

presented

depend on the following three points :—

(1) Forests in relation to climate and rainfall.

(2) The regulation of moisture, and

(3) Forest produce required by the country

country like India

over the several seasons of the year

of the State

ancient countries

to proper control and protection

in the general interest of the country

ment of the Peasantis

forests in Bombay in 1847

final retirement from India

and the forest areas extensive

Forest Act of 1878 [illegible] enactments give power to the Government:—

1. To declare any area belonging to the State or over which the State has rights, to be a State forest.

2. To demarcate such area and to [illegible] forests.

3. To provide for the proper protection and management of the State forests.

4. To provide for the protection and management of [illegible] forests not included in the reserved State forests.

5. To provide for the preservation of private forests which are of special importance to the community as a whole.

6. To provide for the protection of forest produce in transit.

7. To provide for the determination and settlement of private rights in forest lands.

[illegible] operation or not, as may be required from time to time.

[illegible] brought under the control of the Department.

[illegible] will only be possible in cases of absolute necessity.

[illegible] Forest Service [illegible] the Forest Department [illegible] but we may [illegible]

for promotion to the controlling staff

thousands

steadily extending

to those followed in the British territory

We can on that hand [illegible] present you with what I consider satisfactory figures. The net surplus of the Indian Forest Department after meeting all expenses, has been as follows since 1864-—

NET REVENUE OF INDIAN STATE FORESTS.

1864-67	Average annual net revenue	£[illegible]
1867-72	" "	£1,[illegible]
1872-77	" "	£1,[illegible]
1877-82	" "	£2[illegible]
1882-87		£3[illegible]

The annual net revenue during the period 1882-87 was nearly [illegible] per cent. that of the period 1877-82, and although we are in possession of the detailed figures for the years 1887-88 and 1888-89, I may state that the gross revenue realised in the latter year surpasses that for the period 1882-87 by almost £400,000. I estimate for the whole area of the Forests the revenue is as yet small, but there is the hope & and that twenty-five years hence the net surplus will be four times the present amount or [illegible] per cent. This is a prospect which is [illegible] to the Forest Department and to the country. The growth of revenue is of slow progress and the completion of the administration of a country the size of departments on the lines laid down than was given by the watch-word, "continuity of action."

BURMA

EXTRACTS FROM RULES REGARDING RESERVED FORESTS.

1. Whoever a forest reserve be present shall present notice of the begin of shelter and [illegible] of [illegible] which will not a [illegible] Any person who in a reserve forest is [illegible] of this rule liable to [illegible] Waters of such begin of which a presumption under section 2 [illegible] to him to [illegible] to Rs. 50 or to [illegible] the damage resulting from his offence amounts to more than Rs. 25 [illegible] the amount of [illegible] damage.

2. Such license may be granted by the [illegible] officer to whom [illegible] such powers is subject. Provided that [illegible] license may not be [illegible] during the months when [illegible] must [illegible] [illegible] from the 1st March to the 1st June and the hunting or shooting of [illegible] is [illegible] from the 1st June to the 30th September.

3. Such license to be in form prescribed and a fee of Re. 10 may be charged for the issue thereof.

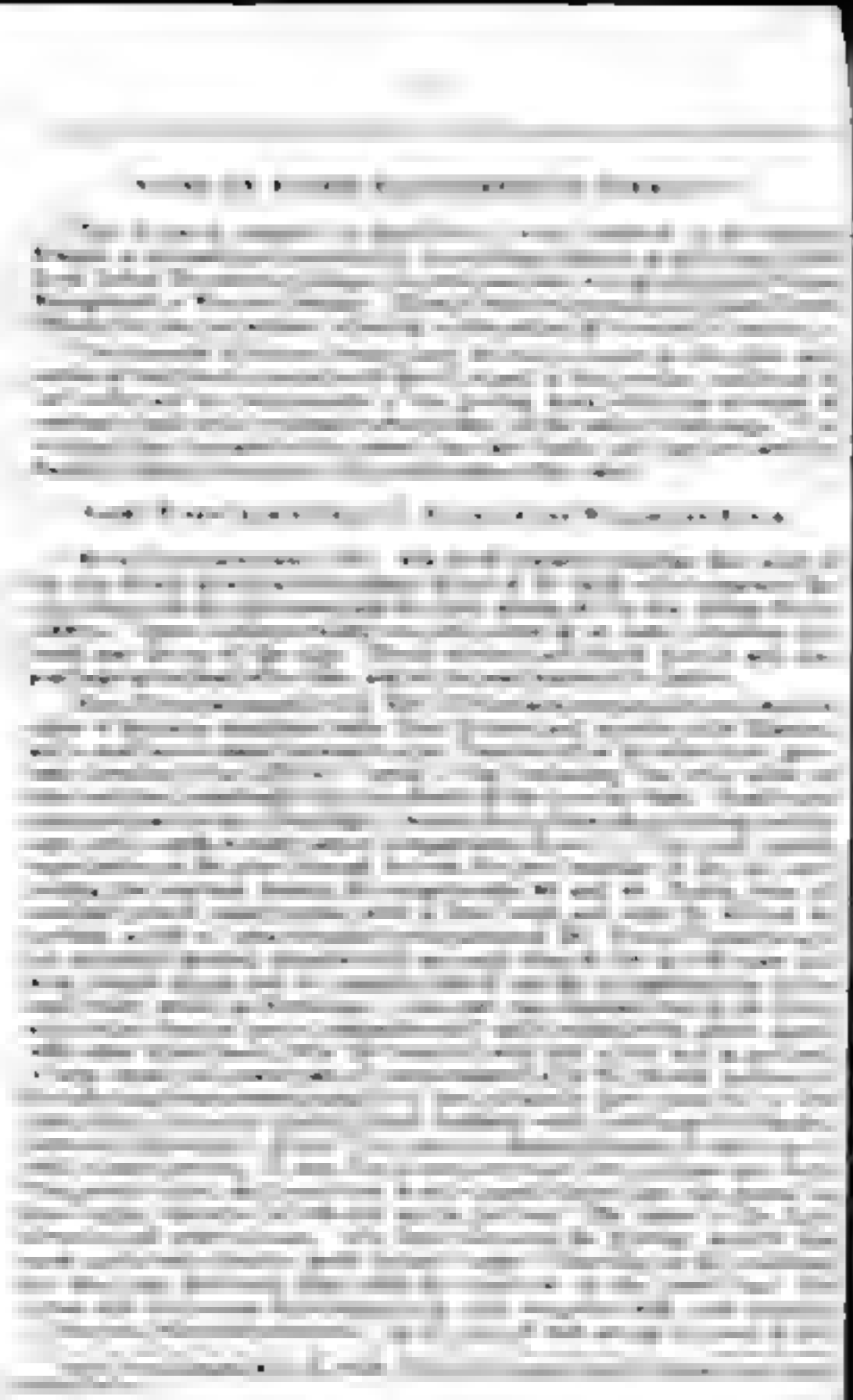
4. Between the 5th day of January and the 15th day of June no person shall [illegible] the purpose of [illegible] a reserve forest any fire burning therein shall have taken the following precautions, namely:—

(a) He shall, at least one week before kindling such fire have given notice of his intention to do so to the nearest forest officer.

(b) He shall have cleared all inflammable matter a belt of [illegible] feet in width all round the place wherein he proposes to [illegible] such fire.

(c) He shall have kindled such fire at a time when no high wind is blowing in the direction of the reserve.

Any person who, in contravention to this rule, leaves any fire burning in such manner as to endanger a reserved forest, is punishable under section 26 of the Act with imprisonment for a term which may extend to six months, or with a fine which may extend to Rs. 500, or with both, in addition to such compensation for damage done to the forest as the convicting court may direct to be paid.



silver fir and beech, with a little oak

spruce and larch

Nassiwald and Dresselbach, ately purchased

included within forest limits since 1885

Utilization of Forest Products

arising from their operations

these forests

districts

roadside

ordinary timber

of standing trees

inches long

happen

were 19.4 and 15.9

burnt.

posed of

es the old trees are being cleared away rapidly

Regeneration of the Forest.

200 years or

[illegible]

The [illegible] the following. Area and actual yield are for 1886 —

		Area and actual yield		
	Proportion of [illegible] to the total	[illegible]	Actual [illegible]	
			Total	Per [illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

[illegible] amounting to 70 mk. (£3 10s.) each householder

[illegible]

[illegible]

forests has been entrusted to a State forest officer

such places the birch is also

absent, and the wild raspberry

present in these forests

metres per hectare.*

the young growth had come up

more for clean stems without branch knots

visit the Schonmunzach glass works

pine generally fetches a somewhat big

of the path

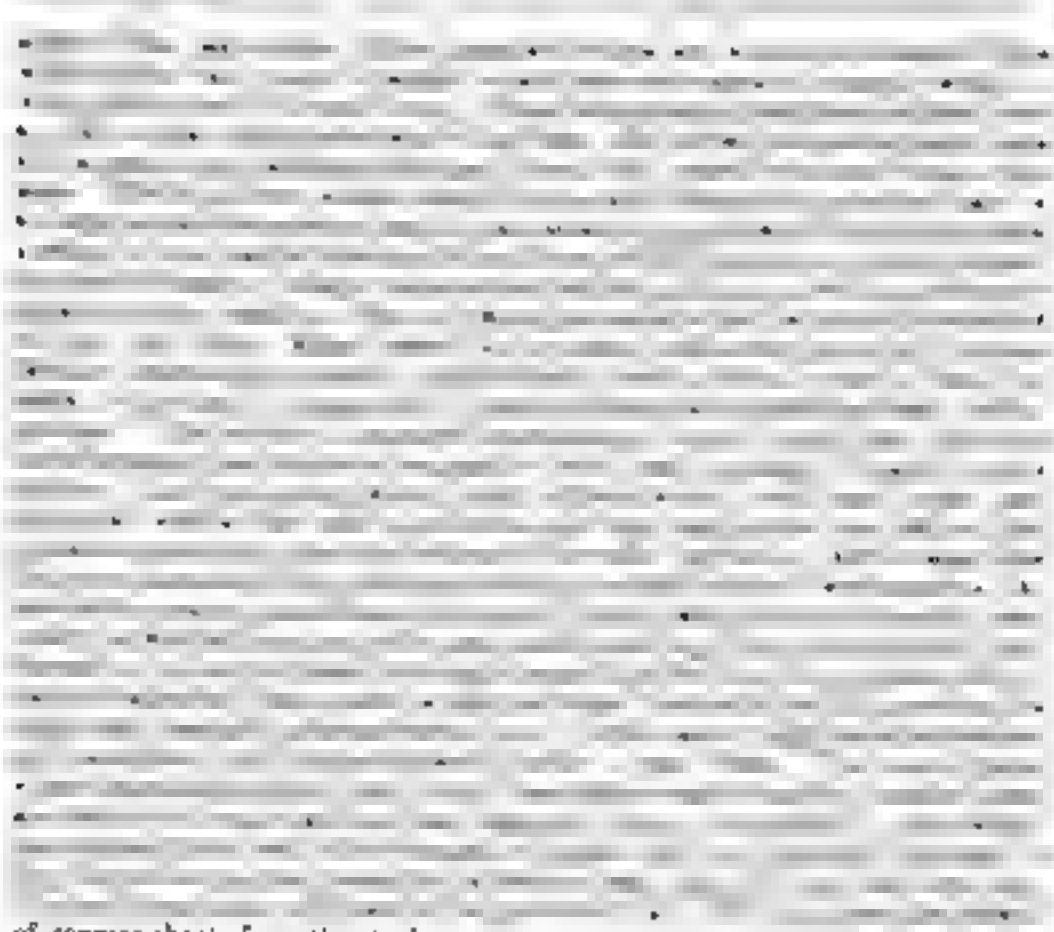
in length, are carried down the valley

tribution of the trees of which the forest is composed

Coppice and Field Crops in the Siegen District

to near 700 m. (2,300 feet), the rocks of which clay

circle of Siegen



of coppice shoots from the stool

the corn is cut

shoots from the stools.

shoots of the oak

assigned to the full committee

In order to maintain the copses well stocked, cutt

and the insufficiency of arable land in the district.

65,000 cwt. a year

been cleared by cutting the coppice.

converted into spruce forests

taire de culture des bois," 4th edition. 1860 p. 424

of the population

High Forests and Field Crops

or 85.7 cub. ft. per acre.

been rooted up

special value in this r
damage by night frost

wood, decides the point

33. Forest pasture can only take place between the months of May and October

34. Before sunrise and after sunset, cattle are not allowed in the forests exceptions may be made in those cases where, on account of the distance, the cattle must remain in the forest In such cases, however they must be kept during the night in sheds, or within a ring fence.

35. Unless proprietors of cattle have a right to use certain paths, the use of road to be used in going to the pasture grounds and watering places, is indicated by the forest officers.

36. Sheep and goats are not admitted into the forests. In special cases, exceptions may be made by the forest authorities, with the consent of the forest proprietor

37 Each head of horned cattle must be provided with a bell.

38. Each village community is obliged to employ one or several herdsmen for their cattle, as may be necessary

The members of a village community may not drive their cattle themselves into the forests, nor may they send them with a herdsman of their own, separate from the herd of the village Where a right of pasture does not belong to a village, but to an association of proprietors, they must entertain a common herdsman for their cattle. Single proprietors having rights of pasture entertain their own herdsmen.

nded :—

to frequent damage by fire

than the present value of the fee

carried beyond the demands of a wise economy

to other cases in the same States where the cutting down of the trees, which had prevented the rain from collecting into torrents and running off in sudden and floods, has given rise to ravines from seventy to eighty feet deep.

Similar results often follow in the north eastern States from cutting the timber on the "pine plains" where the soil is usually of a sandy composition and loose texture.

Woodlands in European Countries.

In 1862 Rentzsch calculated the proportions of woodland in different European countries as follows —

Norway	66.00 per cent.
Sweden	60.00 "
Russia	30.00 "
Germany	26.58 "
Belgium	18.92
France	16.79
Switzerland	15.00 "
Sardinia	12.29
Neapolitan States	9.42 "
Holland	7.10
Spain	5.02
Denmark	5.50 "
Great Britain	5.00 "
Portugal	4.40 "

In many places peat is a general favourite as a domestic fuel; hence though Norway has long exported a considerable quantity of timber and the iron and copper works of Sweden consume it in great, very large, the forests have not diminished rapidly enough to produce very sensible climatic or even economical evils.*

Forests of Great Britain.

The proportion of forest is very small in Great Britain where on the one hand a prodigious industrial activity requires a vast supply of gaseous material, but where, on the other the abundance of coal which furnishes a sufficiency of fuel, the facility of importation of timber from abroad and the mildness of climate and surface conspire to reduce the necessary quantity of woodland to the lowest expression.

With the exception of Russia Denmark and parts of Germany no European countries can be compared with the forests in their relative preservative influences as England and Ireland. The climate possesses a latitude secure an abundance of atmospheric moisture the general configuration of surface is not such as to expose it to speedy injury from torrents and it is probable that the most important climatic action exercised by the forests in those portions of the British Empire is in its character of a mechanical screen against the efforts of wind. The

* Railway ties or sleepers are largely exported from Norway to India and sold at Calcutta at a lower price than a number of other woods can be obtained from the native forests.

From 1861 to 1870, Norway exported annually, on the average, more than 60,000,000 cubic feet of timber.

Since 1877 the quantity of the annual exportation of timber from Norway and Sweden has steadily increased, and in 1881 it was so large that it might well excite the grave anxiety of all friends of the forests of Europe.

and

accidental, not the purpose of the laws

have now been formed

nerations later, Colbert uttered the prediction: "France
Still the extent of wooded soil was very great, and the

42,000,000 acres,

of 82,000 hectares

devoted to the growth of wood than to any agricultural us

the replanting of woods

over the surface

who v from the forests of the State or of the communes

Forests of Italy

and desolated by torrents in another

Forests of Germany

reach a supply of fuel for boiling it down

rows of trees and even much lower obstructions, are of essential

shelter, which experience has proved to be useful in F

would produce opposite effects in the two regions.'

times ruins the crops of the season."

ancient climate *

forests.

Influence of the Forest on the Flow of Springs.

both in number and in volume. This fact

cattle neither grass nor water

and the humidity of the soil.

Marchand cites the following instances —

it was remarkably abundant and sufficient in

Importance of Snow

Importance of Summer Rains

sections of the Union it is as follows —

Northeastern States	41 inches
New York	36
Middle States	40½
S. W States and Indian Territories	
Western States and Indian Territories	30
Texas and New Mexico	24½
Oregon and Washington Territory	50

precipitation

Increased Demand for Lumber.

especially of the commercial fleets and navies of Chris
within the present century have incredibly augment

at $50,000,000

able forest

feet

Evergreen trees are thoughtlessly destroyed in large numbers for the purpose of decoration and on festive occasions. Thrifty young groves of evergreens have been ruthlessly cut down in this reckless way

to 60,000 centner or three thousand tons weight

7,200,000,000

Effects of Forest Fires

unproductive for a century

served to hold its mineral particles together and to retain the water of precipitation and thus unites, pulverizes and dries the earth. It destroys noxious insects and worms, with their eggs and the seeds of trees and of smaller plants. It supplies, in the ashes which it deposits on the surface, important elements for the growth of a new forest clothing as well as of the usual objects of agriculture; industry and by the changes thus produced in the ground for the reception of a vegetation different in character from that which had spontaneously covered it. These new conditions help to explain the natural succession of forest crops, so generally observed in all woods created by fire and then abandoned. There is no doubt, however, that other influences contribute to the same result because effects more or less analogous follow when the trees are destroyed by other causes, as by high winds, by the woodman's axe, and even by natural decay. *

When the forest is left to itself the order of succession is constant, and is never reversed; a species is always replaced by some hardier predecessor. It is obvious that the trees which require most light are content with the poorest soil and vice versa. The trees which first appear are also those which propagate themselves farthest to the north.

The birch, the larch, and the fir bear a severer climate than the oak or the beech.

The difficulty of protecting the woods against accidental or involuntary fires is one of the most discouraging circumstances attending the preservation of natural and the plantation of artificial forests. In the spontaneous wood the spread of fire is somewhat retarded by the general humidity of the soil and of the beds of leaves which cover it. But during drouth, the superficial layer of leaves and the dry fallen branches present an inflammable surface, and the fire spreads with fearful rapidity until further progress is arrested by want of material, or more rarely by heavy rains, sometimes causes as many meteorologists suppose, by the conflagration itself.

* These differ in their power of resisting the action of forest fires. Different woods vary greatly in their combustibility, and even when the early growth of trees are alike, the [illegible] the surface differs greatly according to the [illegible] The white pine, for example, is one of the most valuable in the northern [illegible] of America; and while in company with the [illegible] [illegible] by so long and close a [illegible] Professor Emerson believes that the growth of this pine was even accelerated by a fire brisk enough to destroy all other trees.

UNITED STATES CONSULAR REPORTS ON EUROPEAN FORESTRY

There is a great deal of useful information respecting European systems of forestry contained in a volume entitled "Forestry in Europe," published at Washington, Government Printing Office, 1887 from which the following extracts have been made:—

COPY OF CIRCULAR.

DEPARTMENT OF STATE,
WASHINGTON November 30, 1886

To the Consular Officers of the United States

GENTLEMEN: *You are instructed to prepare a report covering the following questions on Forest Culture and Forest Preservation. I would ask you to devote especial attention to the practical phases of the question, that your replies may serve as a basis for framing forestry legislation in this country, where the subject is of great and increasing importance.*

1. Areas under forests, distinguishing, where possible, between State and private areas.

2. Common forests, if any, and privileges of the population in them. If pasture is permitted, how are the trees, etc., protected?

3. Organization and functions of government forest bureaus.

4. Revenues from government forests, cost of maintaining or managing forests; profits of forest cultivation.

5. Forest planting and culture, methods; bounties, if any; schools, their organization and courses of study.

6. Destruction of forests, causes and results.

7. Reclamation of sand dunes, or waste places by tree planting.

8. Sources of timber supply; trade in timber, bounties on importation, if any, and customs duties.

9. Give the names of three reliable sellers of seeds and shoots in your district.

10. Transmit to the Department copies and translations of the forest laws of the district in which you reside. The general laws should be forwarded by the Consul-General; the local laws, by the Consuls.

I am, Gentlemen,

Your Obedient Servant,

JAMES D. PORTER,
Assistant Secretary.

Weights, Measures and Currency

Cental	Equals	220 pounds
Centner meter	"	221.5 pounds
Florin	"	35.9 cents
Franc	"	19.3 cents
Hectare	"	2.471 acres
Joch		1.42 acres
Kilogram	"	2.2046 pounds
Mark	"	23.8 cents

AUSTRIA-HUNGARY — REPORT OF CONSUL-GENERAL [illegible]

[illegible]ERNMENT [illegible]

The forest laws of Austria [illegible] the [illegible] of the forests [illegible] are the [illegible] private [illegible] and are based upon the theory of paternal government.

If the law [illegible] leaves gathered in a forest [illegible] with [illegible] which may serve for framing future forestry legisla[illegible] the greater [illegible] some government and property rights.

The Austrian [illegible] There [illegible] and in the [illegible] especially in Bohemia, Moravia, Upper Austria, Styria, etc. [illegible]

The [illegible] of these vast forests [illegible] for [illegible] the home [illegible] large quantities are exported.

Areas Under Forests, Public and Private

The latest statistics [illegible] the total area of the [illegible] of the Empire at 29 [illegible] hectares [illegible] of hectares [illegible] hectares are forest [illegible] and private [illegible] forests [illegible] hectares [illegible] per cent of the total area of the [illegible] of the Empire.

[illegible] Forests and [illegible] of the [illegible] in Them

As common forests of the [illegible] the several [illegible] cities and [illegible] the [illegible] of these forests [illegible] however [illegible] the different [illegible] general [illegible] forest [illegible] protection against [illegible] that may [illegible] these common forests by the [illegible] exercise of any privilege granted by local enactment.

Organization and Functions of Government Forest Bureaus

The cultivation and preservation of the forests of the Empire of Austria and the administration of the laws with reference thereto are entrusted to the Ministry of Agriculture. The right of appeal, however, in certain contested cases to the Ministry of the Interior is reserved.

Under the supervision of the Minister of Agriculture the several Provincial presidents (*Statthalters*) are authorized to execute the forest laws and regulations, and as next in authority to these *Statthalters* the several district captains are empowered to enforce the laws in question and to exercise a general authority, supervision and control over all the subordinate officers charged with the execution of the forest laws and forest police regulations. This subordinate class of forestry officers is composed of two classes —

1. The officers who have entered the service permanently after passing the requisite examination, and are in the line of promotion, like officers of the regular army.

2. The volunteer officers who for the sake of pursuing their studies and adding practical experience to theoretical knowledge accept the position in the forest service as an honorable occupation but receive a salary in proportion to the extent of their field of action and responsibility.

This latter class, however, like the first, must have passed certain examinations, proving their qualifications before they can enter the service as such volunteers.

The professional and regular forest officers in the Empire are classified as follows:—

A. Forest Inspectors.

2. Chief forest counsellors (called oberforesträthe).
5. Forest counsellors (or foresträthe).
7. Chief forest commissaries (called oberforstcommissare).

B. Forest Technicists.

Forest inspection commissaries (called forsttechniker).

C. Forest Wards Belonging to the Category of Servants.

Forest wards, class I, salary per annum, 500 florins.

Forest wards, class II, salary per annum, 400 florins.

Forest wards, class III, salary per annum, 300 florins.

The forest inspectors are charged with the duty of superintending the execution of all forest laws, of examining the condition of the forest, fostering and furthering instructions in forest culture and acting as adjuncts to the Statthalter.

From early spring until late in the fall the forest inspector should visit and inspect the forests in his district and make a report of each inspecting tour to the Statthalter.

The Statthalter may also order the forest inspector to make special inspecting tours in addition to the regular tour.

The forest inspector is required to inspect the offices of the district captains with reference to forest affairs.

[illegible] imperial forests

[illegible] inspector

[illegible] performed

Forest Register (Waldkataster

[illegible] state of growth, etc.

[illegible] extent of the several forests in the districts are shown

[illegible] the *Landes Zeitung*

[illegible] in Austria, reaches the respectable figure of 21,826.

[illegible]

Forests— Profits of Forest Cultivation

[illegible] The last budget published passes —

The forest revenues, p. a. florins	3,951,650
The forest expenditures, p. a. florins	3,546,240
Profit of State forests	405,410

[illegible]

the true value of these forests to the Empire their influence upon the climate the rainfall and the consequent benefit to agriculture land as well as to the health of the population, should be taken into consideration.

A direct benefit also results to the population from the employment of numerous officers attending to the conservation and preservation of these forests, all of whom are paid and supported by the profits derived from the culture.

It cannot be contended therefore that the people are taxed in order to support a small army of forest officers, who are actually producers earning more than they expend

I base on an examination of the meagre statistics to which I have had access that the gross forest revenue here materially increased during the last fifty years.

The Kataster Real Estate Register shows that in Lower and Upper Austria the net profit per joch was estimated at 1 61 florins in the year 1830 while in the year 1880 the estimate rose to 2 62 florins per joch an increase of almost 100 per cent an incontrovertible proof that the forest laws of Austria, which were passed in 1852 have been of great practical benefit to forest culture

This benefit is proven not only by the increased net proceeds of a given area of forest lands, but also by the growth and greater extent of the area itself

Forest Planting and Care of the Methods Bounties and Schools, their Organization and Course of Study

The methods of forest planting and culture prevailing in Austria are to be particularly observed in the forest laws. There are no bounties paid in the Empire for planting or replanting of forests.

Schools.

The schools for forest culture were transferred in 1874 from the Minister of Agriculture to the Minister for Public Instruction but the regulations and appointments of professors are made by the Ministers of Finance and Education with the concurrence of the Minister of Agriculture.

While there are undoubtedly numerous provisions of the forest culture law which cannot be applied or adopted in the United States the system inaugurated in Austria to train and educate young men for the duty of enforcing these laws seems beyond all question worthy of imitation to the fullest extent

These Austrian schools for forest culture consist of —

A. University (hochschule).

B. Middle or preparatory schools.

C. Elementary or lower schools

The university (hochschule) is situate in Vienna it was founded in October, 1875

Its aim and purpose is the highest possible scientific education in land and forest culture. An expenditure is borne by the State. The semesters terms are so fixed to six that as complete instruction is not perfected under six semesters.

The Students.

The students are either ordinary or extraordinary hearers. The ordinary hearer must produce a testimonium as a graduate of a gymnasium, college or high school (Obergymnasium) — a testimonium which would also admit the students to any university.

Whoever does not possess the qualification of an ordinary hearer may be admitted as an extraordinary hearer if he is eighteen years old and has that degree of preparatory education which will enable him to understand the lectures.

Guests may be admitted to single lectures on notice of the dean (rector). All hearers are subject to the disciplinary regulations of the university.

Immatriculation, Tuition Fee, and Laboratorium Tax.

The immatriculation fee is five florins for all hearers. The ordinary hearers pay a tuition fee of twenty-five florins at the beginning of the semester (term).

Extraordinary hearers pay 1.50 florins for each lecture.

Ordinary hearers, if poor, may as a reward for great diligence, be released from the payment of tuition fees if the college of professors so decides.

The laboratorium tax is five florins for fifteen hours.

Certificates of Attendance.

The attendance at lectures is certified to at the end of each semester. In case of non-attendance the fact is stated on the certificate. The certificates are to be delivered to the dean for examination.

Examinations and Testimonials.

The examinations are public and conducted under the supervision of the dean (rector).

In determining the degree of success in examinations not only the written school examinations, but also the labors in the laboratory and the authenticated studies in chambers are to be taken into consideration.

Every ordinary hearer has the right to be admitted to the state examination if he so desires.

Regular and full diplomas are only issued to ordinary hearers.

Extraordinary hearers can claim only a testimonium certifying to their attendance at lectures, good conduct and general progress in their studies.

Terms of Examinations for Diploman in Forest Culture.

First Group.

1. Physics with climatology
2. Chemistry
3. General and special botany
4. Mineralogy and geology
5. Mathematics

6. Geodesy
7. Mechanics
8. Geometry
9. National economy

Second Group.

1. Forest culture.
2. Forest felling with forest technology
3. Forest preservation with forest zoology
4. Forest laws
5. Forest yield, regulation and management.
6. Forest statistics.
7. Forest engineering

The examinations are both oral and in writing, during which the use of, and reference to, books and memoranda are not permitted.

Only ordinary hearers who have performed the three years course in the university are admitted to examinations for diplomas.

If the student desires to enter the service of the State as a forest officer he must subject himself to, and pass two State examinations, after he has obtained his university diploma.

The subjects of the first State examination are the following:— Physics, climatology, chemistry botany, geology higher mathematics, geodesy and national economy

The second State examinations embraces the subjects of culture, use and yield of forest lands, calculations on values of forests, forest machinery and forest laws

These State examinations are conducted orally and in public. The State issues diplomas to the successful candidates

Middle or Preparatory Schools for Forest Culture.

Three of these preparatory schools have been established in the Empire, one at Eulenberg, another at Weisswasser, and the third at Lunberg

The conditions of admission to the Eulenberg school are the following —

1. The applicant must be a graduate of a lower gymnasium (under gymnasium, or *unterrealschule*, preparatory college.)

2. He must have served with good success for two, or at the very least, one year, as the apprentice of a forest official.

3. He must not be less than seventeen and not more than twenty-four years old.

4. Must be in perfect health and vaccinated.

5. Must furnish security as to means required for instruction, clothing and support.

6. Must pass a preliminary examination by the teachers of the school.

The scholars, whose numbers shall not exceed twenty to twenty-five per annum, reside at the institute

The branches taught embrace mathematics, field engineering, drawing, natural history, forest culture, forest laws, business correspondence, office routine, business, and hunting.

The conditions of admission to the other two middle schools are of about the same character and nearly the same branches are taught there as enumerated in St. Stephen for admission at the university at Vienna.

In all these schools excursions are made by the scholars under the guidance of the teachers for the purpose of combining practical instruction with theoretical knowledge in the branches of natural history, forest culture, preservation and valuation.

Examinations take place at the end of each semester, term.

Elementary (Inferior) Schools for Forest Officers.

The Ministry of Agriculture has established four of these lower schools, one in Trens, one in Silz, another in Landeck and one in Imst.

Course of Study. Mathematics, geometrical exercises, field engineering, measuring of woodland, how to cut and stack wood, measuring of earth and stones, to use drawing, natural history, geology, substantial botany, game as distinguished from other animals.

Forestry. Felling timber, numbering, measuring and piling same, transporting timber from the wood, protection against insects and from accidents, making roads, ditches, etc.

The scholars are required to memorize and explain the most important provisions of the forest laws and to commit them to memory.

They are also taught the use and the care of all implements, materials, etc., used by forest officers, and are made familiar with the keeping and recording of forest books and the methods of the issuing of forest permits and reporting offenses in same, etc.

The duties of these subordinate officers of different forest districts are detailed.

The discipline in these schools as regards the conduct and studies of the scholars, as well in school as in chambers, is very strict.

No scholar is permitted to absent himself from the institution without the knowledge and permission of the director, but if sick or must be excused in the presence of a near relative is allowed to their care, and home, but is then must be cared for in the same manner.

If an offense against the regulations is repeated three times, dismissal follows.

Strict moral conduct is enforced and the scholars are constantly under the direct control and supervision of one of the teachers who is also charged with the duty of visiting the scholars in their rooms.

All moneys belonging to the scholars must be deposited with the teachers who notify the parents of the amount of each deposit. Receipts from the deposit forms and the parents are advised of this regulation.

The requirements of admission are the following, to be noted here in full. They are similar somewhat in the different schools, but as the whole they are framed on a strict moral basis of which only obedience to rules of conduct as a first requisite to a successful course of study.

A young man who has graduated from an elementary to a middle forest school and from that to the university or high school of forest science who has obtained his diploma at the latter and has also passed the state examinations may be said to be thoroughly trained for his profession and to possess a sound knowledge of forest, and thoroughly manly in a professional as well as in a moral sense.

Extracts from General Forest Law of Austria in Force since January 1, 1853

Cultivation of Forests

Sec. 1. Forests are [illegible] state or Imperial forests under the control of the state authorities. [illegible] forests by paying to the state and crownland commissions [illegible] to take forests under their control, to use the timber, or to cultivate the soil by the best methods and systems of husbandry.

Sec. 2. No forest can be withdrawn from the control and used for other purposes except by consent. The consent can only be granted with reference to state forests in the proper political and if great use of strategy or military defense arises the consent of the Minister of War is required.

With peasants' communal and private forests the consent of the forest authorities is required only in part as the interests to be heard in the application, and a case of conflict of interests the matter is to be submitted to the proper civil judge.

The unlawful use of forest for other purposes is punished by a fine of five florins per joch. (1 joch equals 1.42 acres)

The area thus converted is [illegible] to be replanted within a certain time by the forest authorities. In case of refusal the fine is again imposed.

Sec. 3. Newly created tracts of state or communal forest must be [illegible] within five years. A report to be made to the authorities of private forests according to circumstances, and in pursuance of the provisions of section 20.

Sec. 4. No forest shall be devastated, that is to be treated that the entire area is either wholly or in main [illegible]. If the circumstances have not been specially [illegible] by the forest authorities a contravention of this rule will be punished by a fine [illegible] florins per joch will be imposed.

Sec. 5. A regeneration which entirely neglected forests in any form or size is to be introduced. A copy of the regeneration must be given to the authorities who must designate a time for the execution of the regeneration, and this time is to be [illegible]. In the meantime no wood must be felled.

Sec. 6. No newly [illegible] in steep mountains where the timber can not be cut in another manner or the land cut and used [illegible] by regrowth. The woods upon the crests of mountains must not be cut.

Sec. 7. In the choice of large protective masses of the shores and embankment of rivers and in the regulation of torrents to whose control [illegible] are to be observed and trees and shrubs [illegible] repaired.

Sec. 8. The offenses of sections 5, 6 and 7 are punished with a fine of from 5 to 200 florins. Damage arising to others is to be paid by offenders.

official control of grazing and other privileges and

necessary a circuitous route is to be taken

is permitted

permitted

for each offence from 20 to 200 florins

possession, examination of experts, etc

qualified by the government

Sec. 33. The parish authorities are charged with the general supervision of all forests in their respective districts.

Transportation of Forest Products

Every land owner is required to permit forest products to be transported across his land if no other suitable means of transportation can be had except at more expensive

The transportation must be conducted with proper care and all damages arising must be paid

The parish authorities decide whether such transportation across lands of third parties is necessary and fix the amount of damages from which parties may appeal to damages an appeal may be taken to the courts

Sec. 35. Provisions applicable to such transportation over public roads, etc.

Sec. 36. The transportation of wood by means of rafts and the marking of timber require special permission by the authorities of the district. The use of private waters is governed by certain laws according to section 24.

Secs. 37 to 43. Refer to the regulations of rafting, marking of timber, timber protection, rafts, use of rivers and other waters, public and private for rafting, etc.

Forest Fires and Damages by Insects

Sec. 44. The greatest care must be exercised in setting fires or in using combustible materials in or near forests. If negligence arises in connection therewith to the work rate for the fire or in case of damages and was not of such circumstances to either be punished under the criminal code or fined from 5 to 40 florins, or imprisoned from one to eight days

Sec. 45. Every person who finds a burning and spreading fire in or near the edge of a forest is required to use his utmost power to extinguish it. If any person observes a forest fire he is to hold to give notice to the next police station in the direction of the road which he traverses. These parties are entitled are required to give notice to the nearest local authorities and to the owner of the forest or to his forest officials.

Sec. 46. A certain number of peasants can be required by the owner of the forest or his forest officials or by the local authorities to extinguish the fire. The owner must at once report to the case of the fire with the necessary precautions of the apparatus. The local authorities and the forest officials must accompany the posse

Sec. 47. Damages and indemnities are to be paid to the peasants called out to extinguish the fire. The forest officials must preserve order among the firemen and maintain the discipline of the orders. After the fire has been extinguished the place where it started is to be guarded from one to two days or longer if necessary and the necessary number of men called to be made for this purpose.

Sec. 48. Every offense of the regulations of parts 44 to 47 is to be fined from 5 to 40 florins and in case of refusal to pay the fine or offenses to be punished by a fine of from 1 to 3 florins or by imprisonment from 1 to 3 days.

Sec. 49. Damages to property of third parties caused by extinguishing the fire are to be paid by the parties for whose benefit the person was called out. Claims of third parties must be decided against the greatest loss by the officials of the parish

Sec 50 The damages caused to forests by cattle are to be carefully watched. The owners of forests and their representatives are required in case they cannot succeed in preventing the spread of such damage to report it at once to their own immediate superior authorities at the risk of being fined or pay a fine of from 5 to 10 francs. Every person is bound and to give such notice.

Sec 51 The municipal authorities with the assistance of experts must at once take the proper measures to prevent this damage by cattle. All owners of forests whether private or public are required to render assistance and to submit to the order of the authorities who are hereby authorized to enforce their orders.

The expenses shall be borne by the owners of the forests in proportion to the dimensions of their respective tracts.

Forest Preservation Service

Sec 52 Provision for the organization of forest guards to be attached to the forest administration in every case. These guards whether employed by the State by communities or by private individuals to take the oath of office. Form of oath given with reference to performance of duties in preserving forests as law requires.

Sec 53 These sworn guards to be recognized as public guards with all rights guaranteed to police officers by law and authorized to carry the usual arms. Every person is required to obey their orders given in the line of their duties.

Sec 54 The guards shall use their arms only in case of self defense. To wear uniforms.

Sec 55 The guards are authorized to order suspicious persons to leave the forests and to confiscate all tools used for gathering forest products of the parties carrying them in the forest cannot give a satisfactory explanation.

Sec 56 Confiscation of forest products in possession of suspicious party in the forest.

Sec 57 Offenders who are strangers to the guards are to be arrested. Offenders known to the guard are to be arrested only in case they attack or abuse him or if they have no fixed home. Persons arrested to be delivered at once to the competent authorities.

Sec 58 In case the offender was caught in the act and took flight he may be pursued day and the forest and the stolen product attached.

Miscellaneous

Chapter five contains an enumeration of the forests offenses not hereinbefore particularly mentioned and fixes the punishment.

These offenses are: the burning of trees wood and twigs; marking and barking of trees; cutting down trees barking and trees slightly; stripping bark from forest timber exposing the roots of trees cutting or tearing off trees or twigs or leaves; digging or cutting out young trees gathering twigs or branches gathering tree juice of all sorts gathering tree seeds or cones or cotton wool or light wood roots; gathering leaves of all sorts especially if gathered with hoes or iron rakes; taking away earth clay turf stones and other materials or cutting and removing grass and herbs.

This chapter also provides for proceedings and estimate for damages to forests by cattle. Chapter six provides for the mode of prosecution and proper to obtain the damages. Chapter seven provides for proceedings on appeal.

KINGDOM OF PRUSSIA. REPORT OF CONSUL WARNER OF COLOGNE.

Forest Area in the Prussian Monarchy.

The total area of the Prussian Monarchy amounts to 35,479,536 hectares.* Of this amount 8,124,321 hectares are forests being an equivalent of 23·43 per cent. of the total area. It may be stated that this estimate includes all land devoted to the culture of wood.

The apportionment of the forests is as follows:—

(a) 29·4 per cent. equivalent to 2,374,039 hectares belong to the State.

(b) 11·9 per cent. equivalent to 965,727 hectares belong to the Communes.

(c) 1·5 per cent. equivalent to 122,759 hectares belong to institutions.

(d) 2·1 per cent. equivalent to 170,063 hectares belong to corporations.

(e) 55·1 per cent. equivalent to 4,473,933 hectares belong to private individuals.

Under the same heads the Rhenish Provinces and the district of Cologne have the following area respectively:—

Rhenish Province.	Hectares.	Cologne.	Hectares.
(a)	143,284	(a)	11,766
(b)	321,118	(b)	7,358
(c)	7,149	(c)	1,773
(d)	15,965	(d)	1,201
(e)	742,087	(e)	98,294

The forests of Prussia stretch from the Baltic coast over the mountains of the Sudeten, Harts, Thuringia, Teutoberg, Meissner, Taunus, Rhon, and the slate mountains of the Lower Rhine.

According to a rough estimate 4,043,400 hectares of forest area are level, 2,069,500 hectares are hilly and 1,991,300 hectares are mountainous.

Government Supervision Over Communal Forests.

Although the Communes are left free to manage the Communal forests the State government reserves for itself certain rights over the general administration in order to prevent any mismanagement or abuses. For instance in Westphalia and the Rhineland which embrace this consular district the communities and public institutions are left free to administer their own forests, but at the same time the government gives certain instructions regarding the culture and utilization of the forests which the local authorities are bound to carry out without any alteration on their part not first consented to by the government. Whether it is considered best that the Commune be allowed to appoint the officials intrusted with the supervision of the forest is left to the discretion of the government. In leaving the election of the forest officials to the Communes, they are to elect

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*Consul Warner says: "Considering the vast amount of technical knowledge required in every one pertaining the whole system of forest culture in Prussia, I have not the remotest idea of the proper of a report on this subject, and I am glad to refer you for the information you desire to Consul-General von Wurmb, chief of the Consular district of Cologne, for such information.

One hectare equals about 2·4 acres.

The total area of forest in the Empire of Germany is 13,000,000 hectares, or 25 per cent. of the total land area.

tuting any other judicious presentation

master)

[redacted]

The Bureau of Receipts and Disbursements

The Bureau of Receipts and Disbursements is under the Ministry for Agriculture, Domain and Forest. It consists of [redacted] branch offices in [redacted] under [redacted] heads:—

1. The central bureau of the department in the Ministry for Agriculture, Domain, and Forests

2. [redacted] under the control of the local government under the Department of Taxes, Domain, and Forest

3. [redacted] under the control of [redacted] reports to the Bureau of Receipts and Disbursements.

4. [redacted] and the management of the [redacted]

[redacted] of the government, for auditing

possible way. It is, therefore, the duty of the *oberforster* to possess the most exact knowledge of the working of the district confided to his care, and not to neglect visiting the forest daily if possible.

The *oberforster* is an independent officer, and is alone responsible for the duties and salaries of his assistants.

The *oberforster*, on having passed the scientific examination required by the State, is appointed by the Minister of Agriculture, Domains, and Forest, and receives a definite salary with the right of pension. His rank is that of a government assessor. The extent of each forest district varies. There are 679 forest districts in Prussia, and the average size of each district is 3,496 hectares.

The following table shows the area of State forests in the different Provinces, also the number and the average size of each *oberforsterei*:—

Province.	Forest area.	Oberforstereien.	Average size of oberforstereien.
	Hectares.	Number.	Hectares.
East Prussia	359,241	74	4,356
West Prussia	275,174	47	5,813
Brandenburg	389,519	72	5,159
Pomerania	170,618	42	4,069
Posen	182,629	38	5,767
Silesia	181,225	34	4,451
Saxony	168,480	50	3,091
[redacted]	30,154	16	1,822
Hanover	235,974	104	2,269
Westphalia	67,139	19	3,008
Hesse-Nassau	253,093	146	1,733
Rhine Province.	148,284	43	3,413
Total.	2,374,038	679	45,475

There is a treasurer for each *oberforsterei*. He is an independent officer and is alone responsible for the administration of his bureau. The government appoints him, and he is required to give bond for the faithful discharge of his duties.

The foresters under the supervision of the chief forester (*oberforster*), are of two classes, namely those who protect and attend to the practical management of the forests, the so-called *forsters* (foresters), and *waldwarter* (forest attendant), and the assistant foresters, the so-called *forsthulfsaufseher*. The immediate head of the chief forester is the district government, especially its department of finance, and whose organs for the administration and supervision of the forests and the finances are in the person of the *forstmeister* (forest master), and *oberforstmeister* (head forest master). The former has control over a certain number of the chief forests within the government district, and the latter over all in the government district.

REVENUES FROM GOVERNMENT FORESTS. COST OF MAINTAINING OR MANAGING FORESTS, PROFITS OF FOREST CULTIVATION.

The estimated revenue and expenditure of the State forests for the years 1886-87 according to official statement, are given as follows:

Gross receipts	M. 66,070,000
Ordinary expenses	M. 31,062,200
Surplus	M. 25,007,800
Extraordinary expenses	2,450,000
Net income	M. 22,557,800

FOREST SCHOOLS.

In Prussia there exist three kinds of forest schools:

a. Two preparatory forest schools for *forster* and *forstschulzbeamte*. The pupils, from 12 to 17 years of age, receive at these schools an elementary education and practical instruction in forestry under the direction of a *forster*. These schools are intended to take the place of the apprenticeship of two or three years which the student, on the completion of his elementary education elsewhere, would otherwise be obliged to serve at an *oberforsterei* under the direction of the *oberforster*. The advantage of the former is that it combines the elementary education with practical forest instruction.

b. Two forest academies, one at *Eberwalde* and the other at Minden under the department of the Minister for Agriculture, Domain and Forest, and the immediate supervision of the *oberlandforstmeister* one of the chief state forest officials in the Forest Department of the Ministry. These academies are intended to give a scientific education and to fit students for the forest administration service, that is to say, for the higher forest career from *oberforster* upward.

The term of study is two years and embraces the following branches:

A. Fundamental Science.

1. Physics, including meteorology and mechanics.
2. Chemistry organic and inorganic.
3. Mineralogy.
4. Geognosy and geology.
5. Botany.
   (*a*) General botany.
   (*b*) Anatomy, physiology and pathology of plants.
   (*c*) Special forest botany.
   (*d*) Anatomical and microscopical demonstration.
6. Zoology.
   (*a*) General zoology.
   (*b*) Special zoology particularly with respect to the different kinds of forest animals and birds.

7 Mathematics

(a Repertory and practice in arithmetic, planimetry, trigonometry and stereometry

(b) Principles of analytical geometry

(c) Principles of high analyses.

8. General political economy particularly with respect to forest affairs.

B. Branch Science

1. History and literature of forest affairs.
2. Forest statics.
3. Forest planting.
4. Forest preservation.
5. Forest technology
6. Forest valuation, wood measuring forest survey
7. Forest statistics.
8. Forest administration particularly with respect to the organization of forest affairs in Prussia.
9. Forest administration.
10. Redemption of forest claims.

C. Adjunct Science.

1. Jurisprudence, Prussian civil and penal code.
2. Forest road construction.
3. Game law

As aids to study, these academies have extensive collections relating to forest and natural science, botanical gardens, seed collections etc. Each academy is under the direction of an *oberforstmeister*. The lectures are given by scientifically educated foresters and special professors. The student, before he is admitted to these academies, must produce a diploma showing that he has passed the course of studies required at a German gymnasium or at a Prussian technical school of the first class. He must be under 25 years of age, have a good character and show that he possesses the necessary means for studying.

Effects of Forest Destruction.

The destruction of forests is caused mostly by parcelling off large forest estates, which leads to a careless felling of the trees and a little disposition to restore the loss. An eminent authority on forestry science, Dr Otto von Hagen, in writing on this subject makes the following observations

"The forest is a trust handed down to us from past ages, whose value consists not alone in the income derived from wood but also in the importance which it exerts, through its influence on climate and rainfall on land culture. Its importance is not merely a question of the present day or of the present ownership, but is also a matter which concerns the future welfare of the people. This is a truism beyond contradiction, but nevertheless it is daily disregarded by those who are indolent and selfish

ed under such examinies

r larger extent throughout Prussia."

A Brief Retrospect

per cent.

I. Organization.

instruction for foresters etc.

be fixed by the council.

mined by official instructions from the council

5. Only those who shall have passed a government examination as prescribed by the council and have been declared competent by the direction of the interior shall be employed as forestry officials.

6. The chief forest master, the district forest masters and the adjunct shall be chosen by the council on the proper though not binding nomination of the direction of the interior.

The term of service of the chief and district forest masters shall be for three years. The adjunct shall be chosen for a period to be fixed by the council. Retiring officers are eligible for re-election.

7. The chief forest master receives a salary of 3,400 francs. When traveling on official business his traveling expenses shall be reimbursed. A further sum of 1,000 francs is allowed for clerk and office expenses.

8. District forest masters receive an annual salary of 2,800 francs. While on official business in forest service they receive a daily allowance of 10 francs, and [illegible] office expenses [illegible] cantonal forests [illegible] to be determined by the council.

9. The council shall fix the sum to be paid to the adjunct out of the appropriation provided in article 2.

10. The daily allowances when inspecting such [illegible] shall be paid from the cantonal forestry fund or from the appropriations provided in article 2, depending on whether they concern matters connected with the cantonal or non-cantonal forests.

11. Forestry officials are required to give bonds in the amounts to be determined by the council.

12. Each corporation shall elect a board of overseers of not less than three members for a period of three years and shall give notice of each election to the directors of the interior.

13. The employment of foresters [illegible] forests [illegible] matters pertaining to cantonal forests.

14. Townships, corporations and private owners are to pay the salaries of forestry officials appointed by them. [illegible]

15. Cantonal foresters shall be chosen by the direction of finance on the [illegible] though not binding nomination of the chief forest master. The choice of [illegible] foresters [illegible] board of [illegible] eight members. The term of service for [illegible] foresters shall be three years. [illegible] This period of service takes effect [illegible] from the first [illegible] after the promulgation of this act.

16. The providing of foresters for private forests is left to the owners. But as soon as a forest district is organized, the owner may decide upon the appointment

arithmetic will be required

by the police officers

the interior

FORESTRY IN FRANCE.*

The Woods and Forests of France.

In 1876, the last year for which anything like complete returns are available, the total wooded area of France, exclusive of isolated trees, such as those growing in parks and on road-sides, which were not planted for the sake of the timber they produce, amounted to 35,464 square miles, or a little more than 17 per cent. of the entire area of the country. The proportion in other European countries is as follows, viz.:—

	Per cent.
Russia	40
Sweden	34
Norway	25½
Germany	26
Turkey	22
Switzerland	18
Greece	4
Spain, Belgium, and Holland, each	7
Portugal	5
The British Isles	4
Denmark	3½

The average of all European States taken together is 29½ per cent. The population of France being 188 per square mile, it follows that the area of woodland per head is about three-fifths of an acre.

Some changes, which will be noted in a subsequent chapter, have taken place in the area of the State forests since 1876, but in that year the woods and forests were owned in the following proportions by the different classes of proprietors, viz.:—

	Square miles.	Per cent.
The State	3,784	10.7
Communes and sections of communes	7,949	22.4
Public institutions	124	0.3
Private proprietors	23,557	66.6
Total	35,464	100

and these figures may be taken as fairly representing the actual position at the present time.

Forests are not so exhausting to the soil as agricultural crops. In the case of the latter the entire plant except the roots, which are sometimes also taken, is removed; whereas with a crop of trees, the leaves, flowers and fruit, which are far richer in nutritive elements than the wood, are annually returned to the soil, and thus serve to maintain its productive power as well as, by their protective action, to keep it in a good physical condition. Hence forests can flourish on comparatively poor soil, some kinds of trees, notably most of the conifers, being able to grow on ground that would be quite incapable of producing a series of

*By Major F. Bailey, R.E. Vol. XI. of the "Transactions of the Scottish Arboricultural Society."

pastoral life

It is said that if the trees could be grouped together, so as to form a series of pure forest, the proportion of the total area which would be occupied by each species would be as follows:—

	Per cent
Oak (Q. sessiliflora and Q. pedunculata)	29
Beech	19
Hornbeam	12
Silver fir	7
Scotch pine	4½
Evergreen oak (Q. ilex)	4
Maritime pine	3
Spruce	3
Larch	2
Other kinds	16½
Total	100

The small number of species which enters to any important extent into the composition of the French forests is very remarkable. Thus it appears that oak, beech and hornbeam occupy 60 per cent. of the tree covered area, more than one half of the remainder being taken up with six other species, but many other kinds are disseminated throughout the forests in various proportions according to circumstances. As a matter of course however the trees are not grouped together in the above manner and neglecting blanks, the crop on the ground is actually constituted somewhat as follows:—

	Per cent.	
Pure forests—		
Broad leaved oak or beech	15	
Coniferous (silver fir pine, spruce, or larch)	13	
		28
Mixed forests—		
Broad-leaved (oak, beech, and hornbeam)	52	
Broad-leaved and coniferous (beech and silver fir or oak and pine)	18	
Coniferous (silver fir and spruce)	2	
		72
Total		100

Or separating the broad leaved and the coniferous forests from those which consist of a mixture of the two, we have —

	Per cent.
Broad-leaved forests, pure and mixed	67
Coniferous forests, pure and mixed	15
Broad-leaved and coniferous forest	18

The State forests show a smaller proportion of pure crops than are found in those of the communes, but they also comprise a very much larger proportion of forests in which the crop consists of a mixture of broad-leaved and coniferous species. The first of these differences is due to the circumstance that a mixture, which is always desirable from economical considerations, has been systematically maintained in the State forests from a remote period, whereas this has not always been the case in the communes. The second difference is chiefly accounted for

[illegible] 121,741 tons weight of tanning bark, 2,[illegible] tons weight of cork, and 1,5[illegible] tons weight of resin, the whole being valued at £[illegible]. The average production of wood was therefore [illegible] feet per acre, and the gross revenue accruing [illegible] this produce, which was very small, was equal to [illegible] per acre.

[illegible] it is calculated that the [illegible] trees not grown for the sake of their timber and which yield together [illegible] per annum [illegible], [illegible] the total production of wood in France [illegible] to about twenty-one and [illegible] loads, and [illegible] of the wood [illegible] about £16,5[illegible],000. This gives the amount of wood and [illegible] value of forest produce per head of the population as 2[illegible] cubic feet and 5s. 9d. respectively.

Of the twenty-one and one-half [illegible] loads of wood produced, about four [illegible] loads were timber and [illegible] firewood. The latter suffices for the national requirements, but the former was far from doing so, for the imports of wood in [illegible] exceeded the exports by 2,[illegible] loads, valued at £[illegible],408,[illegible], that is to say that [illegible] was less than two-thirds of the amount [illegible]. The question of foreign timber supply is therefore a very important one even for France, which has 17 per cent. of its area under forest.

FORESTS MANAGED BY THE STATE FOREST DEPARTMENT.

The forest law of 1827, which is still in force, confirmed the previous legislation, under which all woods and forests which form part of the [illegible] of the State, [illegible] those which, being the property of communes, or sections of [illegible] or public establishments, are susceptible of being worked under a regular system, and [illegible] all those in which the State, the communes, or public institutions possess a proprietary right jointly with private persons, are administered directly by the State Forest Department in accordance with the provisions of the forest law.

The areas thus administered at the commencement of 1885 were as follows, viz.:—

	Hectares		Square miles
State forests	1,012,[illegible]	=	[illegible]
Communes, sections, and public institutions	9[illegible],8[illegible]	=	[illegible]
Total	2,0[illegible]	=	[illegible]

These figures, which include the dunes, represent about 5[illegible] per cent. of the entire area of France, and nearly one-[illegible] of the total wooded area. An additional [illegible] square miles of barren land had up to the end of 1884 been purchased by the State in connection with the project for the consolidation of bare and unstable slopes on the great mountain ranges, and this area is also administered by the department under the forest law. About 40 per cent. of the State forests are situated on the plains, while the rest of them, together with nearly the whole of the communal forests, are found in about equal proportions on low hills up to an altitude of [illegible],700 feet, and on the higher mountain ranges. About one-half of them stand on limestone rock, 92 per cent. of their entire area being actually under wood.

will then be examined

forests now belonging to the State owe their origin to ei
ving sources — They either formed part of t
at the time of the ordinance of 1669 or of the severe
of the revolution in 1790 or they have been more recently
domains

rightholders participate in it

scientific forest management

one same terms as are those of the commune and sections.

of the institutions

permission has not, in all cases, been acted on

3" = 1 mile). Pending the completion of

re two main systems of cultu one known as "high forest," and th

by a "final felling." In this
ay cut down and disposed of, the young crop being

natural forest is obtained

In the coppice system the regeneration is coppice shoots.

There are two methods of treatment, *simple coppice*, in which there are no reserve trees and the crop is clean-felled over successive portions of the forest

and *coppice with standards*, in which standard trees are selected and reserved with a view to their remaining throughout several [illegible] conversion from the system of coppice to that of high

growing stock to accumulate to the req[illegible] extent while the small size of the greater part of these forests renders [illegible] unadvised to the treatment [illegible] would have to undergo [illegible] at their conversion. The coppice system [illegible] ng c[illegible]

[illegible] rests as the communes possess being found chiefly [illegible] mposed of coniferous trees, which will not

saved high forest on a large scale, or the [illegible] take the conversion of coppice to high forest

area of their high forest is now treated in this manner

entirely

t it is impossible here to enter into anythi ike full details regarding
practised in France, ref e must be made to the books on the subject, among

plans must be approved before they can be adopted

and is gathered annually, trees take many yea to grow to a marketable siz
the natural

out annual

such a simple matter If the forest is of great extent, it

the old trees in such a manner that they may leave behind them a
sown crop to take their place, and so on throughout a

down on the map, the temporary pro

wood-land, and will not be dealt with in the working plan
trees will be removed from it. Suppose that the annual yield of the central
section which is 50 acres in extent, has been fixed with reference to the
estimated rate of growth and degree of completeness of the stock at 50 cubic feet

number of equal or nearly equal blocks, from each of
of trees is to be cut; after taking windfalls, the choice falls on the
those which are dead or dying being selected first. The section

the number of such trees to be cut annually $\frac{100 \times 80}{150} = 54$. The section will then
divided into blocks, from each
taken. In this manner a

yield of a particular class of produce can be assured, and that

completed for more than two-third
what less than one-half of the com-munal forests

ave for the most part been complete

xtremely superficial manner In order to gain anything like
the systems pursued in France the following works should

Products Obtained from t

plan it is the business of the department to realize it as nearly as circumstances

As to tanning bark and that the fol cross or poles will yield is anticipated

to overwork them Resin is collected on a scale in forests of maritime which only yields it freely on the hot and dampe vests of the south west

The yield of minor produce, such as ...tter and other things and details regarding it not ...ewhat aside this class of p

state and communal forests taken together ave 5,620,663 loads (50 cubic feet) of wood about 40 cubic feet per acre also 51,743 tons of tann

r acre of the State forests somewhat exceeded that of

amount of building timber that she consumes

of trees, or as to their species tion but they are ho
l sold on the best estimate that o rty can make of their value as they

avoided.

be accurately estimated beforehand

must advance all the mon for the work and the forest officers become c
with a large an te, while a number of purchasers

some other manner

in the

the practice of er ring upon such engagements is gradually dyi out

effected in the State forests are determined by each conser with reference to

forest

n market

y the forest department at their cost. The account is adjusted

towns it is found cheaper to purchase what is required in the market

Without roads in order to render the forest accessible and to facilitate the export of characteristics of a country

subject

partly also because the average size of these within them are not needed to

At the end of 1867 there were worked by water-power

from the hills of Marva

Financial Results of Working

Taking the average of the last three years for which the accounts have been [illegible] it is found that the receipts, expenditure and surplus of the State forests were as follows, viz.:—

Revenue	£1,2[illegible] = 10s. [illegible]d. per acre	
Expenditure	[illegible] = [illegible]	
Surplus	£726,401 = 5s. 11d. per acre	

But of the money spent on the afforestation of [illegible] and [illegible] [illegible] [illegible] [illegible] [illegible] the expenditure on the [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] working from the working of the [illegible] forests is [illegible].

The latest year for which [illegible] regarding the gross returns per acre of the State and [illegible] [illegible] [illegible] were as follows, viz.:

	[illegible]	[illegible]	[illegible]
	s. d.	s. d.	s. d.
Principal produce [illegible]	[illegible]		[illegible]
Minor produce	[illegible]	[illegible]	[illegible]
Total	[illegible]	[illegible]	[illegible]

The revenue from the State forests [illegible] in 18[illegible] [illegible] higher than that above given as the average of the last three years [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] that the revenue [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] the forests. These circumstances [illegible] to some extent for the [illegible] revenue obtained from the [illegible] forests, [illegible] explanation of this result is to be found in the important [illegible] [illegible] in the system of culture adopted. In 18[illegible] it was observed that the highest rate of gross revenue was obtained from high forest and the lowest from simple coppice, while coppice under standards occupied an intermediate place. It was also found

been said

Simple coppice	Yielded	4s. 4d
Coppice under standards	"	11s. 8d.
High forest of broad-leaved species	"	13s. 1d
High forest of coniferous species	"	5s. 6d

favourable natural conditions

from shooting leases and permits

the State forests

something like the following, viz :—

	Per cent.		Per cent.
25 years	4	60 years	2
30 "	3½	100 "	1
40 "	3	200 "	½

to private forests

Rights of Users

free from such burdens

possess them

hay keep for se-

c) By tolerance, as a temporary arrangement

the same year to nearly £15,000

Pigs	48,388

countries

the documents before t

ument must be

obtained

being concentrated in one part of the forest

to village communities

sold for nearly £621,000

...eir root development, as well as their size, age and the s...
...to which they have been subjected

...r intentionally or through carelessness and the forest law...
...ighting or carrying of fire either inside the forest or within 200...

...een completely freed from a... inflammable shrubs

damage

H...NTING AND SHOOTING

mitted to shoot in the forests under any circumstances

DESTRUCTION OF WOLVES

AND PROTECTION OF UNSTABLE MOUNTAIN SLOPES

valley and in the open country at the f[illegible] of the mountain range. It is to

ever becoming so [illegible]ld not for a a moment be justified

by a series of weirs and other structures, destined to brin[illegible]
by successive stages to a norma. slope, and thus not only p[illegible]ut by

measures of prevention

works are undertaken at the public cost

so advanced has to be refunded

by these operations.

The Dunes of the West Coast

much smaller portion is communal property

resin, and the wood of those which have been exhausted being used for railway sleepers and other purposes. But much of the land the maritime zone is not worth as much that region does not yield a sufficient quantity of resin to repay the cost of its introduction, and here it is sought merely to establish a crop of grass on the ground.

The law of 1857 relative to the treatment of the dunes which is still in force provides that the government may order the planting up of any area which in the public interest requires to be dealt with. When the sand or any part of the slope constitutes a property whose owner does not wish to undertake the work, it may be acquired by the State from the municipality or the department. As soon as the work is advanced has been completed the land is restored to the proprietors, who are bound to maintain the work in good condition and not to fell any trees without sanction of the forest administration. The system of raising forests on private lands would not be likely to succeed elsewhere, but here the extreme poverty of the land and the prospect of the large quantity of valuable resin that will yield in the hot and moist climate of the south-west interest proprietors to undertake the operation for the State to engage in.

Before the forest department took over the work in 1862 111,747 acres had been dealt with, and the entire area has now been completed. The works have to be most scrupulously maintained in order to prevent a recurrence of the evil.

ADMINISTRATIVE ORGANIZATION AND DEPARTMENT STAFF

Administrative Organization. In order to carry out the work which has been briefly described in the preceding chapters, a corps of professional foresters, composed as follows, is maintained, viz.:—

1	Director of the forest department	superior staff.
9	Inspectors-general	
39	Conservators	
245	Inspectors	
234	Assistant-inspectors	
308	Sub-assistant-inspectors (*gardes generaux*)	
[illegible]	[illegible] guards and guards	subordinate staff.

This body of officers is employed partly in the ordinary duties of the department as being in administrative executive or protective charge of the areas for which the forests provide, but of A grades are employed for their more effective and better control, partly in special researches which are charged with the preparation of working plans with the treatment of unstable areas and with the extension of grazing arrangements, and partly with the central office at Paris. The following statement shows the number of officers of the superior staff employed on each kind of duty.

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Central Office	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Total	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

[illegible]

The Central Offices at Paris

Since 18[illegible] the forest department has been under the Minister of Agriculture [illegible] Minister of Finance. [illegible] The central office is [illegible] branches of the work [illegible]

[illegible]

general's circle extends over 1,918 square miles.

The [illegible] officer [illegible] the manager of the forest estates. He prepares projects for the various

motion to fill the vacancies that may occur

ead-quarters with his own opinions and recommenda

consolidation of mountain slopes

reported by his immediate superiors

number of the unoccupated vacancies

The yearly pay of the various grades is as follows

	£	£
Director of the forest department		800
Inspectors-general, three classes	480 to	600
Conservators, four classes	320 to	480
Inspectors, four classes	160 to	240
Assistant-inspectors, three classes	120 to	152
Sub-assistant-inspectors, three classes	80 to	104
Sub-assistant-inspectors, on probation		80

ncluding the time spent in the

leges as soldiers

forests by their superiors

[illegible]

[illegible]

sefly described.

The controlling and teaching staff is comp[illegible] as follows, viz —

1 director with the rank of inspecto[illegible] professor of political econo[illegible] and forest statistics,

1 deputy-director (professor of forestry

1 assistant professor of forestry

1 inspector of studies (professor of law

1 assistant-professor of law

[illegible]

professor of applied mathematics

[illegible]

1 professor of mi[illegible]tary science

1 assistant-inspector for experiments

[illegible]

[illegible]tary science and none [illegible] them except the professor of agriculture, who is [illegible] f the faculty of scien[illegible] at Nancy have any other duties

The salary of the direc[illegible]rises from £360 to £480, with £80 a year sump[illegible]

[illegible] fixed from time to time, the maximum rate being £240. The [illegible]

[illegible]

ordinates

required to pass the entrance examination are as follows.

school which may be estimated as follows, viz.:—

Salaries, scholarships, tours and examinations

Total annual payments by government . . . £4,9.2

period of his training is raised to about £930

are worth £10,000 total £22,000

instructed with the charge of a sub-division

remainder were foreigners of other countries

the school examinations

follows, viz. —

and geography

the courses for a short time in 1883

etothes.

the form of practical work done in the forests

THE PRIVATE WOODS AND FORESTS OF FRANCE

1. To protect mountain slopes

streams or torrents.

2. To preserve springs and water-courses.

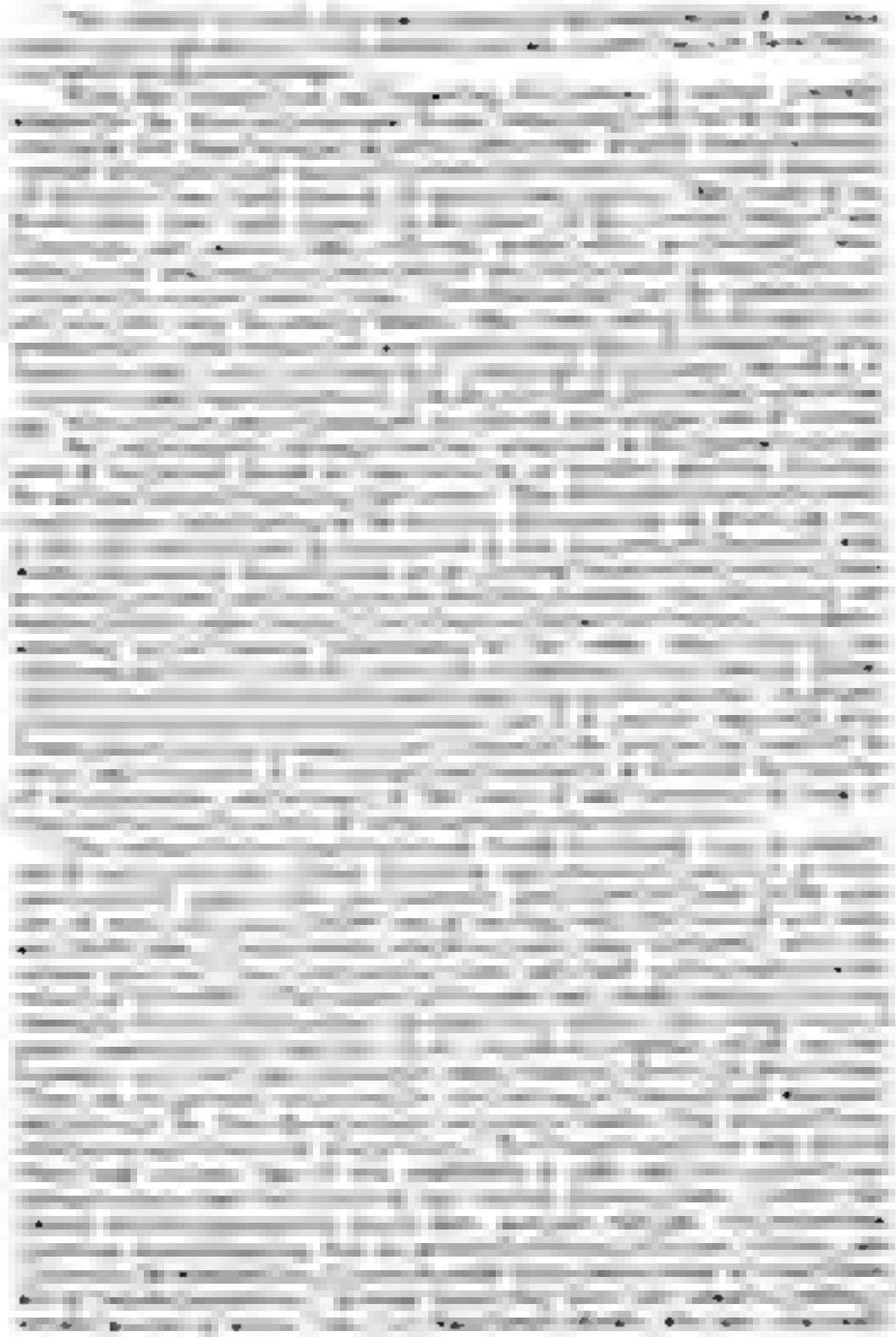
of moving sand

5. For the defence of the national frontier

6. For sanitary reasons

extent than formerly

cleared of inflammable shrubs



permitted to render assistance in this manner but they frequently attempt to imitate what is being done in the State forests, without knowing the reasons for what they see, and they are thus led to commit serious mistakes, as, for example, when in treating a forest which is to be permanently maintained as coppice under standards, they follow the procedure adopted in a neighboring State forest which is undergoing conversion into high forest. In many cases, of course, the private woods are too distant from the State or communal forests to permit of their owners obtaining any advice or assistance from the officials of the forest department, and they are then thrown entirely on their own resources.

THE TIMBER RESOURCES AND TIMBER TRADE OF CANADA.[1]

[illegible] vicissitudes that have attended it.

[illegible] in different years.

[illegible] which will be first presented.

[illegible]

[illegible] fire.

[illegible]

[illegible] timber are numerous, the principal being :—

[illegible] used in the United Kingdom.

[illegible]

[1] F. B. Hough. Report upon Forestry (U. S.) 1878-79.

decidedly favorable to the interests of the British

tonnage

left after the season's shipments

other countries

were sent from British North America

gish market

21,740,900 cubic feet

"The following table shows the expansion of the trade in recent years, the quantities being cubic feet

	Hewn wood	Sawn wood
1872 Total imports	89, 21,650	154 185 400
From British North America	22, 74,200	89,414,400
Percentage from British North America)	24 7	25 6
1873 Total imports	96,568,600	70,788,150
From British North America)	8,396,750	47 717 950
Percentage from British North America:	17 8	27.9
1874 Total imports	122,989,700	190,982,350
From British North America	23,818,750	53,809,400
Percentage from British North America	19.5	28.2
1875 Total imports	84,396,250	164,881,800
From British North America	16,843,350	47,951,400
Percentage from British North America	19.9	29.9
1876 Total imports	107 914,750	205,130,900
From British North America	78,727,450	56,367 350
(Percentage from British North America	21.8	27 0
1877 Total imports	103,240,650	228.637 400
From British North America	24,295,000	62,910,400
Percentage From British North America)	23 5	27 4

"A number purchasing countries of Europe have participated in furnishing these immense supplies of wood but the most notable increase apparent during the past few years, has taken place in the quantities of pitch pine imported from the Southern States. A few years back the demand for this wood in England was limited, being used only for a few special purposes. Increase quantities have been shipped to Europe during the last few years, and have not been sold on speculation, it was sold frequently at very low prices, in some cases at rates that did not cover the freight and expenses, hence it has been introduced into many districts where it was formerly unknown, and competes with the lower grades of Canadian pine but more particularly with red pine

"Sweden and Norway supplies the United Kingdom with from 4,000,000 to 6,000,000 cubic feet of hewn wood during the last few years more than Canada

"But a very large proportion of the goods under this heading consists of pit props, and spars, and other small wood of little value In the matter of sawn wood these countries furnish Great Britain with some twenty or twenty five million cubic feet more than the Dominion. The best Swedish deals do not compete with the best quality of Canadian pine but find a readier sale than the second and third qualities of the latter

"This trade must be of great value to the shipping interests of Canada and Great Britain but I have no means of ascertaining the exact number and tonnage

this purpose is very considerabl

and finally thronged the woodyards of Liverpool."

not the size but the texture of the wood."*

producing it is not likely to flood the home markets.†

upon a manufacture

definite opinion for the following reasons

years, would rest on an unsound basis, and

adapted to the export trade

any ocean fr

valley

drain large regions extensively timbered

entice vessels merely for a return cargo

from the Maritime Provinces

affords employment to upwards of 25,000 men.

cut sticks as large as he could

respecting the course to be pursue

rtake it with determination

this country

Canada

enforce the laws for prevention of forest fires, it is

all other considerations out of sight."

soil etc

years, and they will yield good cutting timber

Valley to lightning but they occurred some time ago."

impossible to express any opinion on the subject

from the fact.

the signal for measures of a far more stringent character

the North-west this witness replied

of investments

only to forest science, but to the whole community

yields immense returns

It is claimed that the area under forests in Sweden amounts to 150,000

than there is in the north of Europe, if we except Russia

Other Statements Concerning the Forest Resources of Canada

of fires in the woods

following statements and opinions

of these forests in meeting the demands of commerce —

the more smiling landscape at home."[1]

[illegible]

his report for the year 1879, says:—

[1] [illegible] sermons, by John White, Fellow of Queen's College [1880], pc 188.

cut down for commercial purposes

a material wealth of $357 750

the rate of $26,250 per

left to rot and dry is inexcusable

further continuance of the square timber trade.

utilized

penniless and often in debt when they return to the woods

furnishing what is wanted

European opening for their lumber

staple export should not meet with equal success

[redacted]

of sound judgment, patience, and perseverance.

Exportation of Forest Production of Canada

[redacted]

purpose

duty on wood from the north of Europe

been temporary and were limited to July 1820†

they were taken off altogether

in 1864 wh

** 4 Geo. III, c. 38. These were doubled by 30 Geo. III. c. 77 and afterwards partially increased by the 5 Geo. III. c. 93 and by the

consolidated by the 59 Geo. III. c

The duty upon a load (50 cubic feet, of E the timber which at th

† *Parliamentary Papers*, 1826. vol. 3. (360), p. 4.

Comparison of the Several Classes of Forest Products Exported from the Province of Canada During the Twelve years Preceding the Formation of the Dominion Government.

(Quantities and Values.

Years.	Ash		Birch		Elm.		Maple.	
	Tons.	Value.	Tons.	Value.	Tons	Value.	Tons.	Value
1856	2,589	$14,103	4,358	$40,700	58,458	$508,433	18	$169
1857	3,465	20,359	5,028	46,985	37,384	482,329	169	1,593
1858	2,378	18,980	4,065	30,338	19,151	163,729	37	285
1859	4,813	24,057	7,037	66,284	26,278	300,840	84	728
1860	3,478	13,978	9,508	100,739	25,529	307,237	219	1,996
1861	2,422	12,706	6,397	60,585	34,610	285,582	137	1,014
1862	2,496	12,770	4,109	33,424	27,689	202,573	39	282
1863	8,347	42,235	11,256	89,151	53,399	421,180	440	2,620
1864*	1,319	6,667	3,315	26,412	14,337	4,414	53	268
1865†	3,670	22,889	10,468	82,038	49,048	357,656	110	1,359
1866†	2,860	20,938	9,793	72,506	29,483	250,670	183	1 968
1867†	8,831	26,074	9,384	81,575	29,476	252,647	76	642

* Half year ending June 30. † Year ending June 30. Since 1864.

Years	Oak		White pine		Red pine.		Tamarack.	
	Tons.	Value.	Tons	Value	Tons.	Value.	Tons.	Value.
856	33,814	3677 180	361,046	22,062,023	61,943	$471,691	2,[illegible]7	$13,281
1857	48,539	676,659	500,781	2,821,390	81,222	536,458	4,571	28,471
1858	28,304	377,581	344,981	1,911,540	53,142	374,070	995	5,411
1859	31,300	359,731	325,694	2,248,006	45,648	263,547	2,185	11,532
1860	41,858	401,961	490,333	2,382,605	62,573	507,610	2,759	17,023
1861	55,979	696,997	528,112	2,394,852	71 351	508,909	1,802	[illegible],116
1862	47,436	627 317	430,297	2,110,046	66,869	452,113	14,661	88,301
1863	78,397	754,328	600,488	3,304,903	98,329	746,642	19,691	124,355
1864*	28,387	305,546	194,622	918,923	32,853	230,881	5,926	34,304
1865†	118,313	1,089.417	606,300	2,965,534	109,877	781,067	10,849	88,232
1866†	84,026	710,861	450,250	2,324,068	85,852	693,134	11,268	77,489
1867†	62,296	696,461	412,036	2,118,754	78,792	499,858	5,411	36,015

* Half-year ending June 30. † Year ending June 30. Since 1864.

Exports to Great Britain.*

The timber trade of British North America is principally concentrated within the Provinces of Nova Scotia and New Brunswick, and throughout the St Lawrence and Ottawa River basins, and north-western Ontario.

Up to about the year 1842—and partially afterwards—a very much lower duty was levied in Great Britain on wood which was the produce of Canada than on similar imports from European nations. This led to the fostering of a very large trade, especially in hewn timber from Quebec and the lower ports on the St. Lawrence—a region which forty or fifty years ago was looked upon as Great Britain's principal source of supply. Large quantities of white pine and spruce as well as a small supply of red pine are still exported, the first being partly hewn and partly sawn, while the second is mostly in a sawn condition. A considerable quantity of oak, elm, ash and birch is likewise exported.

The following return of shipments will best show the movements of the Quebec export trade for the nine years ending with 1882.

In	1874	854	timber carrying vessels of	636,672	tons cleared out.
"	1875,	642	" "	478,441	" "
"	1876,	786	" "	624,110	" "
"	1877	796	" "	670,820	" "
"	1878,	476	" "	399,832	" "
"	1879,	433	" "	364,023	" "
"	1880	694	" "	556,454	" "
	1881	459	" "	380,186	" "
"	1882,	426	" "	259,925	" "

Small parcels of sawn wood are shipped by steamer from Quebec, and these are not included in the above table, but such supplies although considerably larger than they were some years ago, are not sufficient to alter the fact that this export trade of Quebec is declining.

The following is a detailed statement in loads of the principal items of which that export was composed for the five years mentioned, namely

	1879	1880	1881	1882	1883
Hewn wood					
Square and waney pine	106,009	231,051	182,068	153,343	208,540
Red pine	16,276	28,684	18,440	20,494	20,979
Oak	33,620	46,337	37,667	39,147	42,658
Elm	10,880	20,238	15,945	15,567	14,798
Birch	3,929	11,177	5,878	42,274	4,661
Sawn wood					
Pine deals	122,602	286,900	177,869	144,315	189,018
Spruce deals	89,740	147,673	141,962	127,752	125,106

There are no means of ascertaining the exact amount of the Quebec shipments to the United Kingdom, but it is probably about five-sixths of the whole quantity despatched over sea. The total export of Quebec wood to Europe

*Robert Carrick, *Cyclo. Sweden*, in Forestry and Forest Products (Edinburgh), 1884.

the two first named

required at home and in the United States

exported, are comparatively small.

pine, so that it is not much missed

former

diminished quantity is available for export to I

y, 1892, Mr B E
reported to have sta

largely why people are afraid to stake their money in the business.

necessary revenue.

"Why should not the State of New York now
which little Saxony owns in woodlands, and p

make its Adirondack forests, if not as profitable, yet fairly so, as

the ease, rapidity and spontaneous manner in which this tree reproduces itself. Unlike white pine, which requires a century to grow a standard log, spruce is almost irrepressible, and a spruce forest from which all the trees measuring twelve inches and upwards in diameter have been taken, will, after a rest of two decades, be ready for work again.

It does not appear that any systematic attempt has been made by the authorities to reduce to figures the available quantity of mature spruce now growing in New Brunswick, Nova Scotia, and the immense forest belt which lies between the Ottawa river basin in the west and Mingan in the east. All these districts, however according to Mr. Joly late Premier of the Province of Quebec, contain immense quantities of spruce.*

The following tables exhibit the total number of pieces of squared white and red pine and other woods, and of pine saw logs cut in the upper Ottawa territories of Quebec and Ontario, on Crown lands, and also on private lands from 1826 to 1881 (30th June inclusive that is before and since Confederation as closely as can be learned from the records of the Crown Timber Office Ottawa.†

From 1826 to 1866 Inclusive.

	Square timber		Pine saw-logs (only).	
	Ontario.	Quebec.	Ontario.	Quebec.
White pine	3,048,882	1,759,094	4,084,208	2,230,088
Red pine	1,714,412	978,064		
Other wood	256,950	146,019		
Totals	5,018,744	2,883,177	4,084,208	2,230,088
Deduct from private lands	1,074,418	613,231	874,249	498,804
Cut on Crown lands	3,944,326	1,751,946	3,209,959	1,731,253

*The pitch-pine referred to in this chapter is the *Pinus Australis* of Michaux otherwise the Southern Pine, the trade in which has been entirely developed during the last twenty years. Its importation to Great Britain is extending rapidly. It is obtained from the so-called Pitch Pine States, situated to the east of the Mississippi River, namely the Carolinas, Georgia, Florida, Alabama, and Mississippi.

The wood of the pitch-pine tree is the heaviest of the pine family and, like all high resinous woods, is supposed to possess great durability in climates of moderate severity. A very large industry has been developed in the Southern States in connection with the gathering of its resinous products, such as tar, turpentine, pitch, and the like. 'Turpentine is the raw sap of the tree, and the "boxing" or cupping necessary to collect this is supposed by some to be injurious to the "alburnum" or sapwood, although it has probably little effect on the heartwood, or "duramen."

†A. J. Russell, Crown Timber Agent, Ottawa, in Reports on the Forests of Canada, London, England) 1885.

FROM 1867 TO 1881 INCLUSIVE.

	Square timber.		Pine saw-logs only.	
	Ontario.	Quebec.	Ontario.	Quebec.
White pine	1,025,247	1,118,383	17,920,800	17,277,103
Red pine	460, 41	118,628		
Other wood	283,874	63,219		
Totals	2,849,262	1,301,227	17,920,800	17,277,103
Deduct from private lands	615,279	244,835	3,380,275	2,879,412
Crown timber	2,085,888	1,056,492	14,540,525	14,397,691

TOTAL RECORDED PRODUCT. UPPER OTTAWA AGENCY 1826 TO 1881. 30TH JUNE

Ontario.	7,173,182	pieces pine	494,824	other woods	22,005,108 saw logs.
Quebec	3,955,166	" "	209,338	"	19,507,159 "
Total	11,128,348	" "	704,162	"	41,512,267 "

In the foregoing table it is to be observed that square timber and saw-logs only are included, and all other wood goods are omitted, as unimportant for the object of the table. The dues accrued from them are, however included in the following equally brief exhibit of the revenue accrued from Crown timber dues in the upper Ottawa territories of Quebec and Ontario respectively from 1826 to 1881, inclusive, being from the remotest period of which there are any records in the Crown Timber Office, Ottawa.

Period.	Ontario.	Quebec.	Totals.	Years.
1826 to 1834	$ 151,078	$ 65,033	$ 215,101	9
1835 to 1851	934,720.33	460,643.74	1,396,373.07	17
1852 to 1857	453,052.35	282,879.15	735,937.50	6
1858 to 1866	896,096.33	609,861.74	1,505,957.07	9
1867 to 1881	8,279,033.50	5,439,832.36	8,719,371.36	15
1826 to 1881	$6,732,506.61	$4,668,240.42	$10,971,740.01	56

The collection of timber and slide dues being combined greatly facilitates and tends to secure the accurate collection of both. The same timber and the same men are dealt with at the same time. The returns of the timber rangers of their inspections supported by sworn statements of cullers, afford the means of effectively checking the accuracy of the certificates the lumberers give the deputy slide masters, which through careless error or fraud might be quite erroneous, as to the numbers of saw-logs especially and as to where they came

promptly effected by the officers of the Dominion

The Public Timber Lands of Canada.—Crown Lands.*

Former Timber Regulations in

assignment. In 1851 a ground-rent system was introduced

r the former government of Canada in 1852 A system of local

crisis became inevitable

ground untenable

pared with the prices in England

since it grew to anything like its present importance

The over production of 1846 (which did not find a market that year)

us years, but, in part the unwise course, at that time pursued by the government, of forcing production, as will hereafter appear upon examination of the regulations

It is to the advantage of the shipping interest that production should ag

of the timber territories available, but not to stock them up in unpro-

reponderance of their particula

sustained by facts

was ultimately broken up

great as to obtain [illegible]

remedy

the operation

They suggested, in conclusion, that if the license holders were unable to [illegible]

a change in the navigation law.

Such was the false position assumed by the s[illegible]g interest at the period referred to, but the erroneous grounds upon which they opposed the prayer of the producing merchants of course mad[illegible] it either for or against the matter which had to be dealt with upon its own [illegible]

of the producers.

penalty of an increased payment

an the best timber in the interim.

ment where they did not choose to occupy

ground-rent system is a part were finally the result

annually

quish that which they had already paid a series

fered from the previous great crisis in the trade (that of 1846

ion of demand—the result probably of the war then raging. It

was to enforce it.

It was not, therefore, as put by the op——nts of the producing interest, a

temporary suspension of the penalty

advantage of their outlay

constant accusations of partiality and favor

the system as a whole instead of impairing it

calculated in every case to produce a bad effect

justify its being made an exceptional case

ere is also a large quantity of timber usually absorbed in

sers consequent thereon

monialists, therefore, to be authorized to suspend their

give stability to the trade and satisfaction to the public

the year before, to adopt for the safety of the trade

d to market

a permanent influence on the trade

dues were paid

contrary

[illegible] of Crown Lands [illegible] be [illegible] and kept [illegible] [illegible] was [illegible] [illegible]. Every person [illegible] [illegible] if any [illegible] [illegible] the [illegible] of [illegible] forfeited the timber [illegible] [illegible].

The [illegible] [illegible] of [illegible] the [illegible] [illegible] was [illegible] [illegible] and [illegible] of [illegible].

[illegible] was the system formerly in force. [illegible] not [illegible] the [illegible] [illegible] [illegible] [illegible] the [illegible] [illegible] number of [illegible] of the [illegible] [illegible] of [illegible] [illegible].

Previous [illegible] [illegible] the forests as regards [illegible] [illegible] of [illegible] trespass on [illegible] of the Crown [illegible] [illegible] [illegible] In fact no great [illegible] [illegible] [illegible] was [illegible] in [illegible] [illegible] the seat of government was [illegible] [illegible] Crown Lands Department [illegible] the [illegible] of [illegible] were [illegible] at certain points where returns were brought [illegible] of each [illegible] [illegible] part of those to make [illegible] [illegible] [illegible] [illegible] statement of timber [illegible] it was [illegible] [illegible] to the Department without any actual knowledge of [illegible] [illegible] of cutting. [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] of inquiry and the [illegible] [illegible] the agent and the [illegible] [illegible].

Am[illegible] [illegible] and [illegible] for Timber Dues, Ground Rents and Bonuses in Upper and Lower Canada, During the Years Preceding the Formation of the Dominion Government

Years	Accrued			Collections		
	Upper Canada	Lower Canada	Total	Upper Canada	Lower Canada	Total
	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Total all years	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

* For some years before the [illegible] the seat of government of Canada [illegible] between Toronto and [illegible] [illegible] at Montreal, and at a still earlier period at [illegible].

[illegible]

[illegible]	Amount.
[illegible]	$244,[illegible]12 90
[illegible]	203,263 59
[illegible]	276,741 16
1859-60	3[illegible]6,983 35
1860-61	[illegible]90,933 04
[illegible]	[illegible]83,183 31
[illegible]	[illegible]05,252 15
[illegible]	[illegible]25,294 51
[illegible]	324,535 61
[illegible]	300,486 [illegible]
[illegible]	[illegible]

Recent and Existing Timber Regulations in Canada

[illegible] incident to this interest.

[illegible]

[illegible] the angles of the townships.

[illegible]

if the lease had not expired

The lessee who faithfully carries out the above conditions shall
refusal of the same limits, if not required for sett

claims and costs

it of the Crown dues was evaded by removal of the

paid when due

until a decision can be had by competent authority

[redacted]

or of double the amount thereon.

The penalties for resistance, seizure or removing timber after it was seized were prescribed and proceedings [redacted] herein specified. No sale or grant of Dominion [redacted] and at portages was reserved.

The Dominion Lands Act makes provision for [redacted] lands.

Ontario.—The timber Act now in force was passed in 1860, and is found as Chapter 28 of the Revised Statutes of Ontario 1887. It is as follows:—

(1) An Act Respecting Timber on Public Lands

[redacted] of the Province of Ontario, enacts as follows:

1. (1) The commissioner of [redacted] lands, or any officer or agent under him authorized to that effect, may grant licenses to cut timber on the ungranted lands [redacted] in Council and of which notice may be given in the *Ontario Gazette*.

No license shall be so granted for a longer period than twelve [redacted] from the date thereof; and if, in consequence of incorrectness [redacted]

2. [redacted]

[redacted] if any, and all proceedings pending at the expiration of [redacted]

Crown, within the meaning of said ...tion and ...able, as such to be included in the license.

4 ... taken to have, and to have had all the rights in respect of ...such road ... or cut thereon, as were, or ... thereon, except that he shall not be entitled to take or ... exclusive possession of such road ...

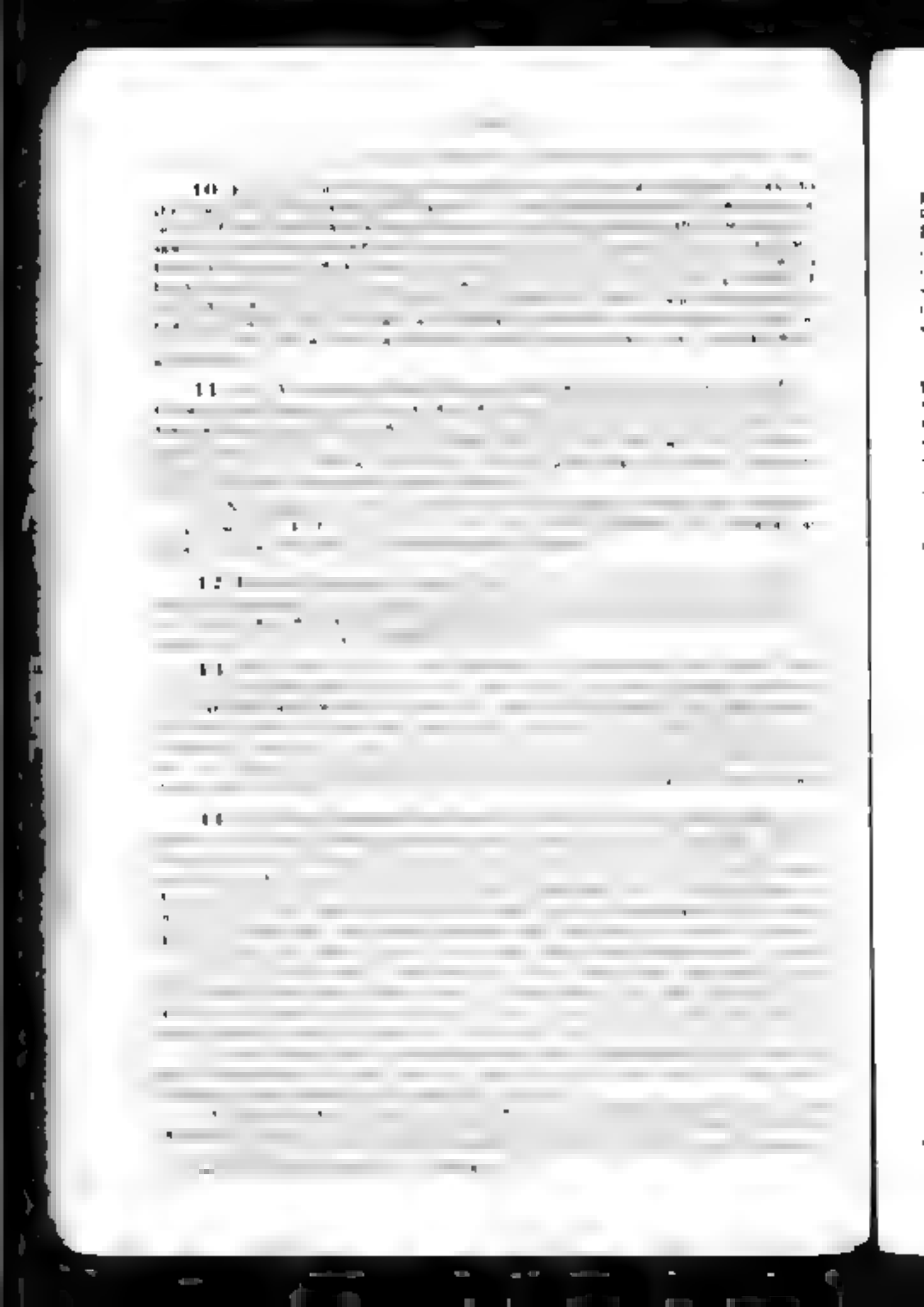
5 No by-law passed, or to be passed by any municipal council for preserving, soli... such license, shall be deemed or taken to have had or have any force or effect against any such license.

6 ... twenty-one obtained a verdict ...

7 ... by-law and the affidavit may be made or taken before any person or officer who under sections 42 or 43 of The Public Lands Act, is authorized to take the affidavits in those sections mentioned.

8 ... such granted townships may be entitled, shall only be in respect of the dues received ...

Stat. Ont. c. 25, ss. 13-15, as to the right of the C... on Free Grant Lands



by the holder

securing and protecting the timber so seized

(2)— Management of the Timber Lands of Ontario

of June, 1866. prior regulations were superseded and ch

advanced

regulations of 1866

with the location of the lands

from that date.—

(8) Crown Timber Regulations

April, 1869)

divided into as many timber berths as he may think proper

highest bidder for cash at the time of sale

Lands may direct

Crown Lands or to such local agent as he may a

6th. The Commissioner of Crown Lands shall keep a

vacancy and open to public inspection

the time of such approval to be expressed in writing

the parties and such award shall be binding on them

[redacted]

[redacted] but lands without authority

[redacted] shall cease, and the berth or berths shall be treated as forfeited

[redacted] shall have been first paid

[redacted] the payment of the following Crown dues, that is to say

Black walnut and oak, per cubic foot	[illegible] 03
Elm, ash, tamarac and maple, per cubic foot	0 02
Birch, basswood, cedar, buttonwood and cottonwood, and all other timber, per cubic foot	[illegible]
Red and white pine timber (per O C 27th April 1887), per cubic foot	[illegible]
All other woods	[illegible]
[redacted] 200 feet board measure	[illegible]
[redacted]	[illegible]
[redacted]	[illegible]
Hemlock, spruce, and other woods, per standard of 200 feet	[illegible]
All unmeasured cribbed saw-logs, to be taken at the [illegible] of the lot, and to be charged for at the same	
Staves, pipe, per cubic	[illegible]
Staves, West India, per mille	[illegible]
Cordwood (hard) per cord	[illegible]
Cordwood (soft) per cord	[illegible]
Hemlock tan-bark, per cord	[illegible]

[redacted]

16th. A licensees, or occupants of timber berths, shall furn through themselves, their agents, cutters, and foremen, to such a

at a satisfactory determination as to the and description of timber saw- ssion, the and in the event of such

forfeiture of his right to a renewal of his license.

license together with the dues thereon

conservation spec- ents description

in such raft and on being sati

ort the arrival of such raft at its destination as above mentioned may be

said on the

30th November following the s

of such outstanding dues at any time the Commissioner of Crown Lan may think proper

46) On The Various Forms of Timber Licenses in Use

n use in the Province of On

is called the "Western Timber District," and the "Be ovi

one comprising the right to cut timber on road allowances and the other

wn Two forms of l enses are used for the "Ottawa Agency" one having a

he right to cut rafting stuff from the Crown lan

which rafting stuff can be cut or purchased

Timber District wi with its notes, give an idea of these di

RM OF A TIMBER LICENSE IN THE WESTERN TIMBER DISTRICT

By authority of Chapter 26 of the Revised Statutes of
Crown Timber regulations, dated the 6th day of April, 1869
ation of the payments made and to be made to Her M
o hereby covenants
and un
s or workmen, full power and license to cut
trees on lands or lots sold under Orders in Council of 27th May 1869, or s

Victoria Chapter eight, upon the location described on
d to hold an

to the ninth of April 18 , and no longer
convey or away the said timber through
the Crown lands, or waste lands of the Crown
thing of this license the said licensee has right by the said
he ground hereby granted, with full power to seize and recover th
But this license is subject to the following condit
the withdrawal therefrom of lots located or sold under the Free Grant

or issue of

wful power the ground hereby

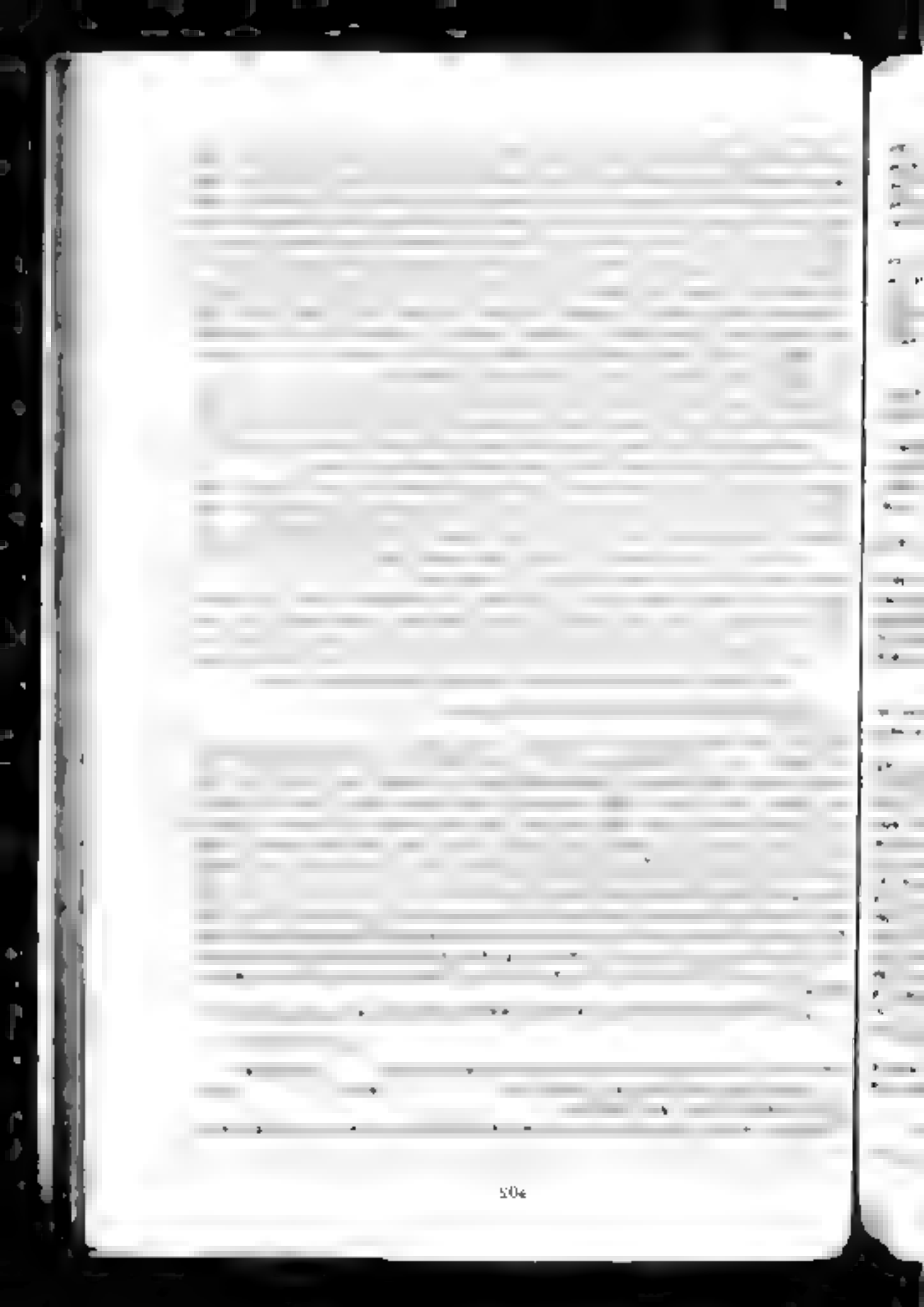
the ground covered by this license stand ng number of any k n without

ment of Crown Lands having first been obtai

by the said licensee or any one acting for or by

That the Commissioner of Crown Lands under Order in Counc

timber upon any lots, mentioned in the description in this
been sold or located subsequent to the date hereof or
scription which may have been equated upon with th
bona fide intention of h r pur
And further under condition that the said



ng is in connection with the manufacture of square pine and board or octagonal pine timber especially the former in squaring which and in the rejection of the upper portion of the tree where the knots begin fully one third of the tree is wasted viz one sixth of the rest of the timber in squaring off to reach the square and one sixth of the upper part of the tree which is left in the woods but which if drawn would be valuable at a saw mill where it could be cut into various quantities of lumber either fit for domestic use or export. The waste referred to has been noticed by this department for years past but under the regulations past and present and the tenure under which licenses to cut timber are held and have been held for many years it is found difficult to uproot a system which has obtained so long and in which there are so many vested interests and so much capital involved.

Production of Timber in Canada 1890

The following table taken from the Statistical Year Book of Canada 1891, p. 46, gives the production of timber in the whole of Canada during the year 1890

Timber	Ontario.	Quebec.	New Brunswick	British Columbia.	Nova Scotia.	Manitoba and N. W. T.
Saw logs B. M.	829,504,283	496,449,000	98,389, 22	70,177,055	78,903,442	30,605,906
Square timber c. ft.	3,302,629	2, 5 [illegible]	16,815			
Booms pieces	50,36	3,240	* 325			
Hardwood, c. ft.	2,52	97,428	+			
Railway ties No.	672,410	230,350	73,498			
Cordwood, cords	20,079	8,7	850			
Telegraph poles	468	650	3,168			
Cedar, lin. ft.	162,348		4, 75,201			
Cedar posts, railway and bolts, cords	4,34	0,789	258			
Pile timber B. M.	[illegible],684					
Shingles, M.		3,331	615			
Battens, lumber etc. No.		1,230	13,78			1,448,616
Posts and rails, No.	* 1 325		6,850			[illegible]6,402
Staves, cubic etc. M.			+ 58			
Dues received, $	879 479	861,082	142,476	29,078		102,257

* Tamarack. †Trans-Atlantic lumber only. ‡Included in square timber. ‖ Railway ties. Pulp and bobbin wood included. § Lath &c.

The Ontario Fire Act

The following Act (Cap 213 R.S.O. was passed by the Legislature of Ontario in 1878, with the view of preventing the occurrence of the fires which have wrought so much devastation among the forests of the Province —

An Act to preserve the Forests from destruction by Fire

Preamble.

WHEREAS large quantities of valuable timber are annually destroyed by fires which are in many instances the result of negligence and carelessness; and it is expedient that provision should be made for the prevention of such fires: Therefore His Majesty, by and with the advice and consent of the Legislative Assembly of the Province of Ontario, enacts as follows:

Power to Lieutenant-Governor in Council to set apart any portion of Province as a fire district.

1 The Lieutenant-Governor may, by proclamation to be published in the Ontario Gazette, set apart any portion or portions of the Province of Ontario to be a fire district.

Publication of fire district.

2 Every proclamation under this Act shall be published in the Ontario Gazette, and such part or parts of the Province as shall be set apart as a fire district shall be described by metes and bounds, or by such other description as may be sufficient for the purposes of this Act.

Revocation.

3 Every such part of the Province mentioned in such proclamation shall cease to be a fire district upon the first day of January in the year next after the year of the proclamation by which it was created.

Prohibition as to setting fire in woods, etc., between 1st April and 1st November.

4 It shall not be lawful for any person to set fire to any woods, bush, prairie, or other lands, or to cause any fire to be set on his own lands, between the first day of April and the first day of November in any year, except for the purpose of clearing land, or burning slash, or for the manufacture of charcoal, or for some other industrial purpose, without having first given notice to the persons mentioned in the following sections of this Act, and complied with the requirements of the said sections.

Precautions to be taken in case of clearing land.

5 Every person who shall, between the first day of April and the first day of November, make or start a fire in woods, bush, prairie, or other lands, for the purpose of clearing land, or for any other purpose, shall, before he does so, notify in writing the occupant of the next adjoining lands to the place where such fire is to be made, of his intention to make or start such fire, and of the time when he will begin to make or start the same; and shall not make or start such fire until the time mentioned in such notice, unless such occupant has consented thereto.

Precautions in case of burning slash, etc.

6 Every person who shall, between the first day of April and the first day of November, make or start a fire in woods, bush, prairie, or other lands, for the purpose of burning slash, or for the manufacture of charcoal, or for any other industrial purpose, shall,

1. Select a locality in the neighbourhood in which there is the smallest quantity of vegetable matter dead wood, underbrush brushwood, dry leaves, or resinous trees.

2. Clear the place in which he is about to light the fire by removing all vegetable matter dead trees, branches brushwood and dry leaves from the soil within a radius of ten feet from the fire.

4. Exercise and observe every reasonable care and precaution to prevent such fire from spreading, and carefully extinguish the same before quitting the place.

7. Any person who shall throw or drop a burning [illegible] shall be subject to the penalties and punishment provided by this Act if he neglect completely to extinguish before leaving the fire of such match, ashes of a pipe, etc.

[illegible]

[illegible] when such fire district shall pro[illegible]

[illegible]

[illegible]

[illegible] stock of such municipality engine [illegible] [illegible] district or portion of [illegible]

[illegible] right angles to each other that is [illegible]

10. It shall [illegible] the duty of every [illegible]

11. [illegible]

peace to a penalty not exceeding fifty dollars over and above the costs of prosecution, and in default of payment of such fine and costs, the offender shall be imprisoned in the common [illegible] for a period not exceeding three calendar months, and any railway company permitting any locomotive engine [illegible] contravention of the provisions of the fourth section of this Act shall be liable to a penalty of one hundred dollars for each such offence, to be recovered with costs in any court having jurisdiction

13 Every suit for any contravention of this Act shall be [illegible] ing such contravention.

14 All fines and penalties imposed and collected under this Act shall be paid one half to the complainant or prosecutor and the other half to Her Majesty for the public use of the Province

15 It shall be the special duty of every Crown [illegible] and all cases coming within the knowledge of any such [illegible] to prosecute every person guilty of a breach of the provisions and requirements of the same

16 Nothing in this Act contained shall be [illegible] affect or interfere with the right of any party to bring and maintain [illegible] shall remain and exist as though this Act had not been passed by the

DESCRIPTION OF [illegible] OF THE STATUTE LABOUR

District No 1.—Commencing at a point on the north shore of Lake Huron where Provincial Land Surveyor Albert P Salter's meridian line between range [illegible] the westerly [illegible] Townships of Matchedash and North Orillia the south-west angle of North Orillia thence north easterly along the southerly boundary of North Orillia [illegible] of Lake Couchiching thence easterly across said lake to the [illegible] the Township of Rama thence easterly along the south [illegible] Townships of Rama, Dalton, D[illegible] and [illegible] the Townships of Harvey, Burleigh Methuen, Lake and Tu[illegible] to the north west angle of the Township of Essex thence southerly along the west boundary [illegible]

Elsewhere to the sou

north-westerly along the easterly boundaries of the T

he waters of said lake and the Ottawa River to the head of Lake

ne produced to the northern boundary of the Province, the said
ng the western boundary of the Fire District established by the

THE ONTARIO FIRE-RANGING SYSTEM

greatly reducing the annual loss through forest fir

of its advantages

May to the first day of Oct

there shall be placed on such limits
as are exposed to danger a man or m

tical bushmen of good judgment and well acquainted with the limit should be selected as the limit holder will nominate the man to be placed in charge of the limit and his subordinates, if any, the department reserving the right to limit the number of men to be employed on any limit and also to reject or remove any man whom it finds unfitted to discharge the duties of the position.

It is hoped that limit holders will recognize the necessity of recommending men of good judgement and good character who while fully discharging their duties, will not harass or annoy settlers or others as if an animus is created in the breasts of the settlers the scheme will undoubtedly fail to effect the results expected. Limit holders will be expected to exercise supervision over those men and see that they thoroughly and effectually perform their duties.

With respect to remuneration the department thinks that the man in charge of a limit should be paid ..... dollars a day which should cover board and ordinary expenses and where special duties are required that such as one men can be employed at ..... dollars per day which should also cover board and ordinary expenses the men will be appointed bush and fire rangers and instructed from here so as to confer them with authority under section 22 of the Fire Act and a copy of the instructions will be furnished each limit holder.

As the limit holder is reaping a large proportion of the benefit, it is intended that he should bear one half of the cost of men and expenses which may be incurred under this scheme.

The department will pay wages and expenses and charge to each limit holder his proportion, which will be a charge upon the limit and an account will be rendered at the close of the season when prompt payment must be made.

Should you desire to avail yourself of this scheme you will at once address a letter to the department to that effect, stating the limit or you wish protected, the number of your license for current season, the number of men you would recommend to be employed and submit a list of those you would recommend for appointment on your limits.

AUBREY WHITE,
Assistant Commissioner.

DEPARTMENT OF CROWN LANDS,
WOODS AND FOREST BRANCH,
April, 1886.

Mountains reads as

Therefore, Her Majesty by and with t
House of Commons of Canada, enacts as

ment and in longitude seven minutes, fifty

Act or any other Act with

2. The said tract of land is hereby reserved and set apart as a public park

hall, except as hereinafter provided, locate, settle upon or occupy any portion of the said p

4. The park shall be under the control and management of the Minister

purpo

5. The control of the hot spr situated in said park and their management and utilization for purposes of bathing, recreation and in every other respect

for su

South of B

The lease for any term of years of such parcels of land in the park as he deems advisable in the public interest for the construction of buildings for or in any way connected with purposes of health and recreation and for the accommodation of persons resorting to the park

(c) The working of mines and the taking and use of minerals and mineral deposits in the park and the granting of permits for the said purposes and the lease thereof, and the terms and conditions to be inserted in any such permits or leases, regulating the manner in which any work in connection therewith shall be carried on so as to preserve the beauty of the park for the purposes for which it is established and to protect it

(d) Trade and traffic of every description

The prevention and punishment of trade and traffic generally and of cattle allowed to pasture in the park

(e) The issuing of licenses or permits for the pasturage of cattle and the management of hay lands

(f) The removal and exclusion of trespassers

And generally for any purpose deemed by them necessary to carry this Act into effect according to the true intent and meaning thereof

4. The governor in council may by the said regulations, impose penalties for any breach thereof, not exceeding in each case a sum of fifty dollars or such lesser sum with costs imprisonment for not more than three months.

5. Every regulation or order of the governor in council after publication for four consecutive weeks in the Canada Gazette shall have the force of law as if it were herein enacted and such regulations shall be laid before Parliament within fifteen days after its first meeting thereafter

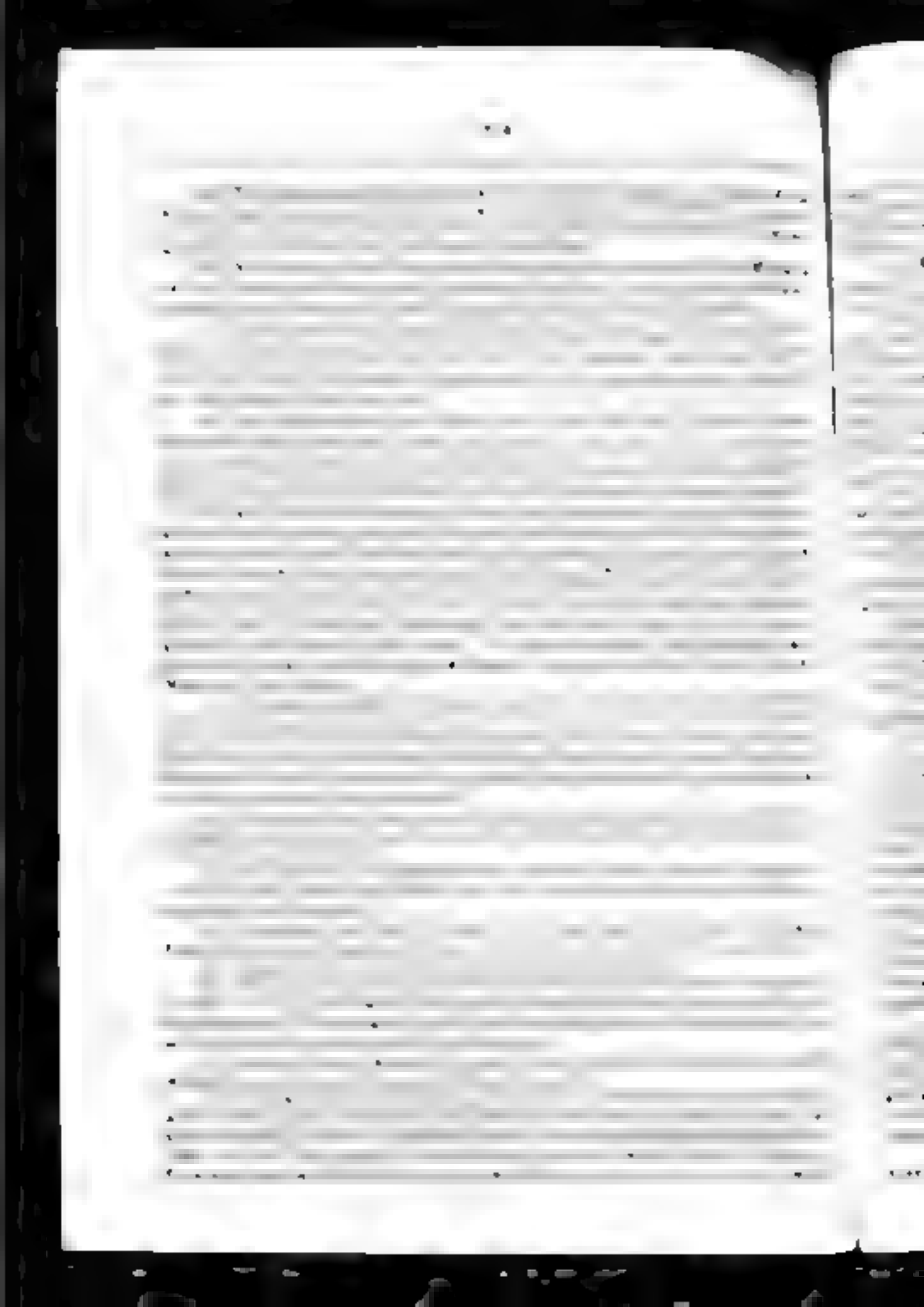
6. Nothing in this Act contained shall affect the obligations of the government if any arising out of the conditions of the acquisition of the North west Territories

7. This Act may be cited as "Rocky Mountains Park Act, 1887

Regulations Respecting Rocky Mountains Park

Order in Council of March 30th 1887 under and by virtue of The Rocky Mountains Park Act 1887 setting apart certain tracts of land in the Province of Alberta and Territories for the purpose of a public park and providing for the management and control thereof and for the protection of timber and game therein and the prevention of trespassing thereon and for the leasing of portions thereof for certain purposes and for the imposition of penalties for violation of the provisions of the said Act and of the regulations established by the said Order in Council.

1. No person shall without permission from the superintendent or his agents settle upon or occupy any portion of the park or cut timber thereon. The superintendent of the park shall have power to remove from the park any person found trespassing thereon and to seize and confiscate any timber, stone, minerals or other property found in the possession of any trespasser and to prosecute for the penalty incurred by such trespasser. No person shall be granted permission to settle upon any portion of the park situated south of Bow River



distribution of the said water

fixed by h[illegible]ase, to set apart such portions of the park as he may think proper
[illegible]arket-places, yards, court houses, places of public worship, b[illegible]

17) All leases or licenses of occupation shall be in such form

(18) No bar-room or saloon shall be permitted within the park

[illegible]ct. The sa[illegible]f intoxicating liquors even under th
special permission granted under sect[illegible]two of the said Act is strictly prohibited, except in hotels, and there[illegible]t shall only be allowed t[illegible]

[illegible]nder this regulation, any intoxicating liquor until his s[illegible]

which in his opinion is unsa

he first day of May in each year and the fees for such license shall be the

) For ard or pool-table, twenty dollars and for nal table

ssippi pigeon-hole or other table or board with
very additional table ten dollars

owling alley ten dollars

25 Every aming and all playing of faro, cards, dice, or other

foresaid

e shooting at, wounding
animal or bird within the park is hereby prohibited, excepting

n their possession game or fish killed within t
ause 29 of these regulations shall be subject t

shall be paid to the superintendent for such materials—

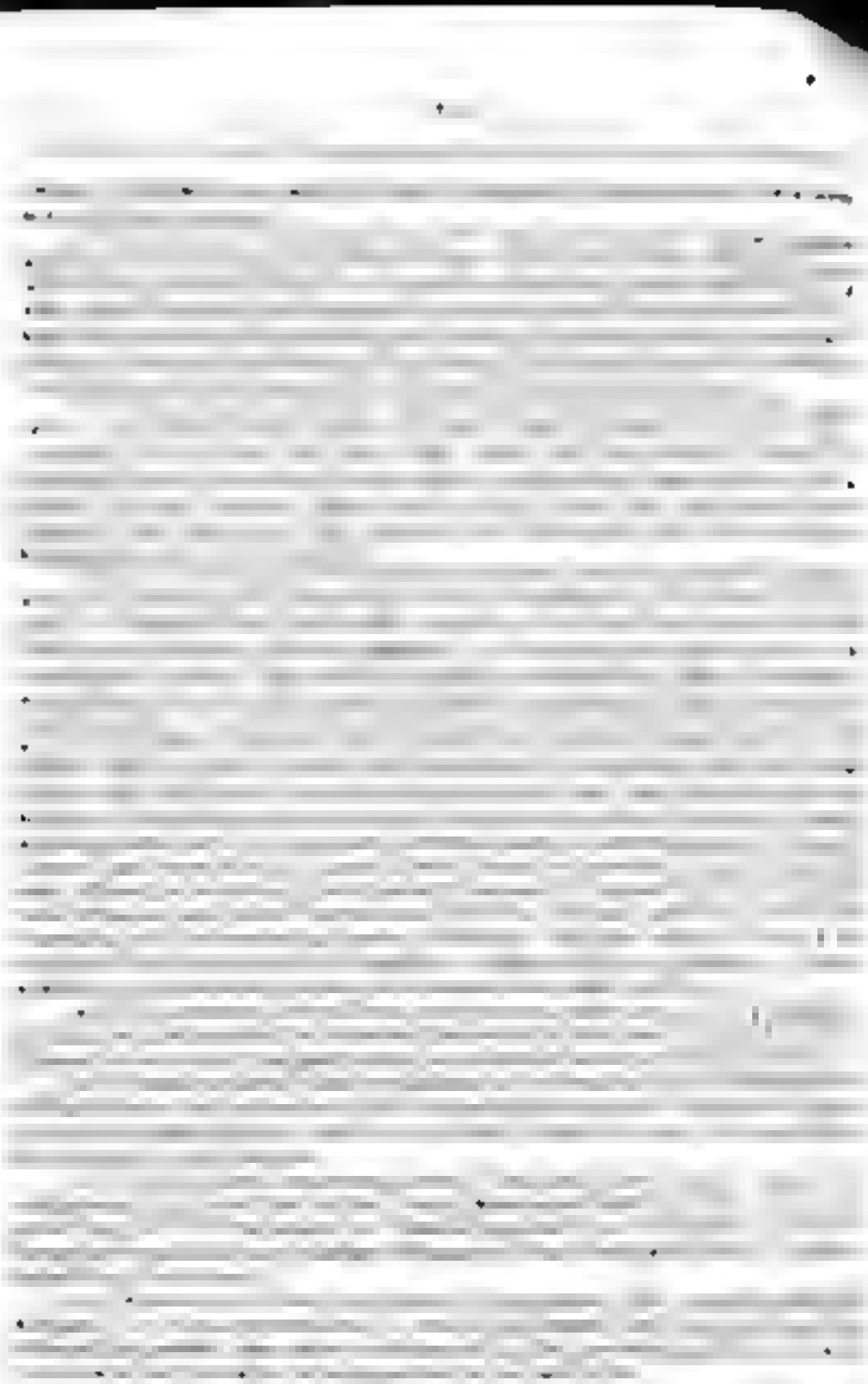
Sand	10 cents, per load
Stone	25 "
Gravel	

Persons desiring to burn ime or manufactur brick within the park
ocation of the kiln
yard and pay a royalty of one cent and a half per b el for a ime
, for al brick manufactured a rate per thousan by the
Minister of the Interior

superintendent, is strictly prohibited

aw to sit and act as a justice of the peace

46) Except as hereinafter specially provided y one who violates any
provision of any of these regulations, shall be li a penalty not exceeding



mineral lands with the Park

nd not exceeding in an sixty years

His Excellency in virtue of the provisions of the above cited A and by and with the advice of the Queen's Privy Council to make

agreed upon by the government and license

in advance

amount paid for rent shall be credited to such royalty

(5 The area to be licensed to one person shall not exceed the

planes or lines in which their surface boundaries

The license shall be subject to the general regulations for the control and management of the Rocky Mountains Park of laced the 30th June 1890 and to such farther and other regulations as may be made from time to time that behalf by the Governor-in-Council

Forest Legislation

ures are tak[illegible] to check the action of destructive causes
ation. It is almost in vain to ex[illegible]t that mere restrictive leg-sla-
anything effectual to arrest the p[illegible]f the evil except so far as

[illegible]rtain extent have been made
[illegible]f the remaining native w[illegible]
[illegible]ue the work with much

snow-drifts, and to supply at a future day timber for ties and f[illegible]

[illegible]hat the leg[illegible] of the State of New York tu-n
atten tion to the subject of tree planting when it pas[illegible]

[illegible]ney were ma[illegible]
was appropriated $5,000 to
[illegible]ayment of sur-
may deem necessary to investigate and report a system of forest [illegible]

comptroller in January 1885 and forward [illegible] the legislature [illegible] Department of Forestry [illegible] that in this session the Empire State should lead the way

As a sequel to, and the result of the recommendations of [illegible] Forest Commission was passed the following May as follows

THE FOREST COMMISSION ACT

Chapter 283 Laws of 1885 as subsequently amended

An Act [illegible] and for the preservation of forests, passed May 16th 18[illegible]

The People of the State of New York [illegible] Assembly do enact as follows

Commissioners How Appointed

Section 1 There shall be a forest commission which shall consist of three persons, who shall be styled forest commissioners who may be removed on the [illegible] For cause. The forest commissioners [illegible] by and with the advice and consent of the Senate

Terms by Lot

§ 2 At the first meeting of the forest commission they shall divide themselves [illegible] one two six years from the first day of February [illegible] Except as to the three terms of office thus determined [illegible] term of office of each forest commissioner shall be six years from the first [illegible] February on which the preceding term expires

How Appointed After 1888. Vacancies

§ 3. During the month of January in the year 1889 and in every [illegible] the Governor [illegible] by and with the advice and consent of the Senate [illegible] for the term of six years [illegible] whose term of office [illegible] February next [illegible] vacancies [illegible]

Salaries

§ 4 [illegible] commissioners shall serve without compensation, except that [illegible] and expenses

Employees and Pay of

§ 5. The [illegible] shall have power to employ a forest warden forest inspector [illegible] and expenses [illegible] Such warden and inspector [illegible] and expenses.

Rooms, Etc

§ [illegible] Commissioners [illegible] for the use and [illegible]

FOREST PRESERVE

public interests of the State, with regard t rest and tree planting, and especially w th reference to forest fires n every part the State. It shall

Fol business

OFFICERS MAY ARREST WHEN

strate shall act as the case may require

KEYS. HOW EMPLOYED UNDER DIRECTION OF ATTORNEY GENERA

State of New York, any action to prevent njury to the forest

the people of the State, an action for the trespass specified in sec

defendant be imprisoned thereunder wi
berties of the ma al as provided in sections seventy-

commission may employ attorneys and counsel to pros

subordinates, arising out is official conduct with reation to the forest
Any attorney or counsel employed she I act under the direction of
the attorney-general shall prosecute and defend such actions

restraining any act of trespass, waste or destruction upon

on in any mind with n the

the consent in writ
he actua narration

comptroller an

SUPERVISORS PROTECTORS OF STATE LANDS, EXCEPT IN FOREST PRESERVE—DUTY OF DISTRICT ATTORNEY [illegible] FOREST GUARDS.

§ [illegible]

INSTRUCTIONS IN FORESTRY IN SCHOOLS

§ [illegible] elementary instruction upon this subject the [illegible]

METHODS OF PUBLIC INSTRUCTION

§ [illegible]

§ [illegible]

§ [illegible]

[illegible]

Officers, Powers and Duties of in Case of Fire

[illegible]

[illegible] prescribed by the said title

No Action for Trespass, When

[illegible] it may not be upon his land

Privilege, Case of Fire

[illegible] fire

[illegible]

§ 6. [illegible]

What Railroad Companies Must Do in Regard to Fires [illegible]

§ 7. [illegible] are not liable to spread beyond control

[illegible]

§ 8. [illegible]

Not to Deposit Ashes, and to Report Fires.

§ 9. [illegible] measures for extinguishing such fires.

Railroad Companies.—In Case of Fire

§ 10. [illegible] effectually arrest its progress

RAILROAD COMPANIES.—PENALTY FOR NEGLECT

§ 28. Any railroad company which shall neglect to comply with the requirements of this Act shall be liable to a penalty of one hundred dollars for each offence.

RULES OF COMMISSION TO BE POSTED

§ 30. The forest commission shall prepare such rules as they may deem necessary for the prevention and suppression of forest fires, not inconsistent with the laws of this State, and such rules shall specify [illegible] under which fires may be kindled in the woods, and shall prescribe such other regulations as they may deem necessary for the protection of the forests of this State. Any person who shall violate any of such rules shall be liable to a penalty of five dollars. Copies of such rules shall be posted by the forest commissioners in such conspicuous places as they shall deem necessary, and shall be posted, and replaced when lost or destroyed.

INCENDIARISM.—PENALTIES

§ 31. Any person who shall wilfully or negligently set fire to, or assist another to set fire to any waste or forest land belonging to the State or to another person, whereby the property of the State or of another person is endangered or damaged, or who suffers any fire kindled by him to escape from his own land, shall be liable for the expenses of the measures taken by the officers of the State, and by its agents and servants, to prevent the spreading or extinguish the fire, and also for all damages to the property of the State or of any person, not exceeding in the whole five hundred dollars, which may be caused by such fires; such actions to be brought in any court of this State having jurisdiction thereof.

APPROPRIATION

§ 32. For the purposes of this act the sum of [illegible] is hereby appropriated out of any moneys in the treasury not otherwise appropriated. And no expenditures shall be incurred by said forest commissioners in excess of this appropriation.

§ 33. This Act shall take effect immediately.

CHAPTER 37.—LAWS OF 1890

AN ACT TO AUTHORIZE THE PURCHASE OF LANDS LOCATED WITHIN SUCH COUNTIES AS INCLUDE THE FOREST PRESERVE

The people of the State of New York, represented in Senate and Assembly, do enact as follows:—

Section 1. The forest commission, with the approval and concurrence of the commissioners of the land office, may purchase lands or lots within such counties as include the forest preserve as established by law, for the purposes of a State park, at a price not to exceed one dollar and fifty cents per acre; such approval and concurrence to be expressed on a copy of the resolution of the said forest commission authorizing such purchase, and certified to by the clerk of said commissioners of the land office.

§ 2. [illegible] purposes of this act, but no purchase of lands shall be [illegible] previous appropriations for that purpose

§ 3. [illegible]

§ 4. [illegible] fect immediately

[illegible] ing bill to the legislature with his signature, the Governor filed therewith the following memorandum

STATE OF NEW YORK

Executive Chamber Albany March 11 1890

[illegible] to such a result

DAVID B HILL

CHAPTER 556.—LAWS OF 1890

[illegible]

AN ACT TO PROVIDE FOR THE SALE OF SUCH LAND FOR UNPAID TAXES

The People of the State of New York [illegible] Senate and Assembly do enact as follows:—

[illegible]

to read as follows

barred from all right and title thereto

repealed

§ 3 This Act shall take effect immediately

fix consideration of 281 separate appointments

pondence is maintained

This warrant reads as follows —

STATE OF NEW YORK

THE FOREST COMMISSION, ALBANY, N Y 189

Esq.,

Town of County of

mission" etc., passed May 15, 1885

twenty dollars

you will turn over all charges of the fire to him

fire if known

supplied with them on application to the commission

forest commission

By order of the Forest Commission
L.S.) Secretary

Rules and Regulations.

general distribution. They have been an importan
and in educating the people in this particular

any cause in this respect.

Protection of Forest Trees.

(Established by the Forest Commission.)

be permitted only when the wind is favourable

guard them until the fire is completely extinguished.

from their carelessness or

0 and 31 of the Forest Commission Act and the follow

away by him or under his direction

From the Penal Code

dollars and be liable to a fine and imprisonment

and fifty dollars, or both

REASONS FOR ESTABLISHING ADIRONDACK PARK

1890 and 1891

nities of land essential to fulfilling the requirements of a suitable park and the probable cost thereof, and to report also in regard to the other subjects referred to in said message of the Governor.

out the year the amount of moisture carried by the

equalizing the temperature of the whole State.

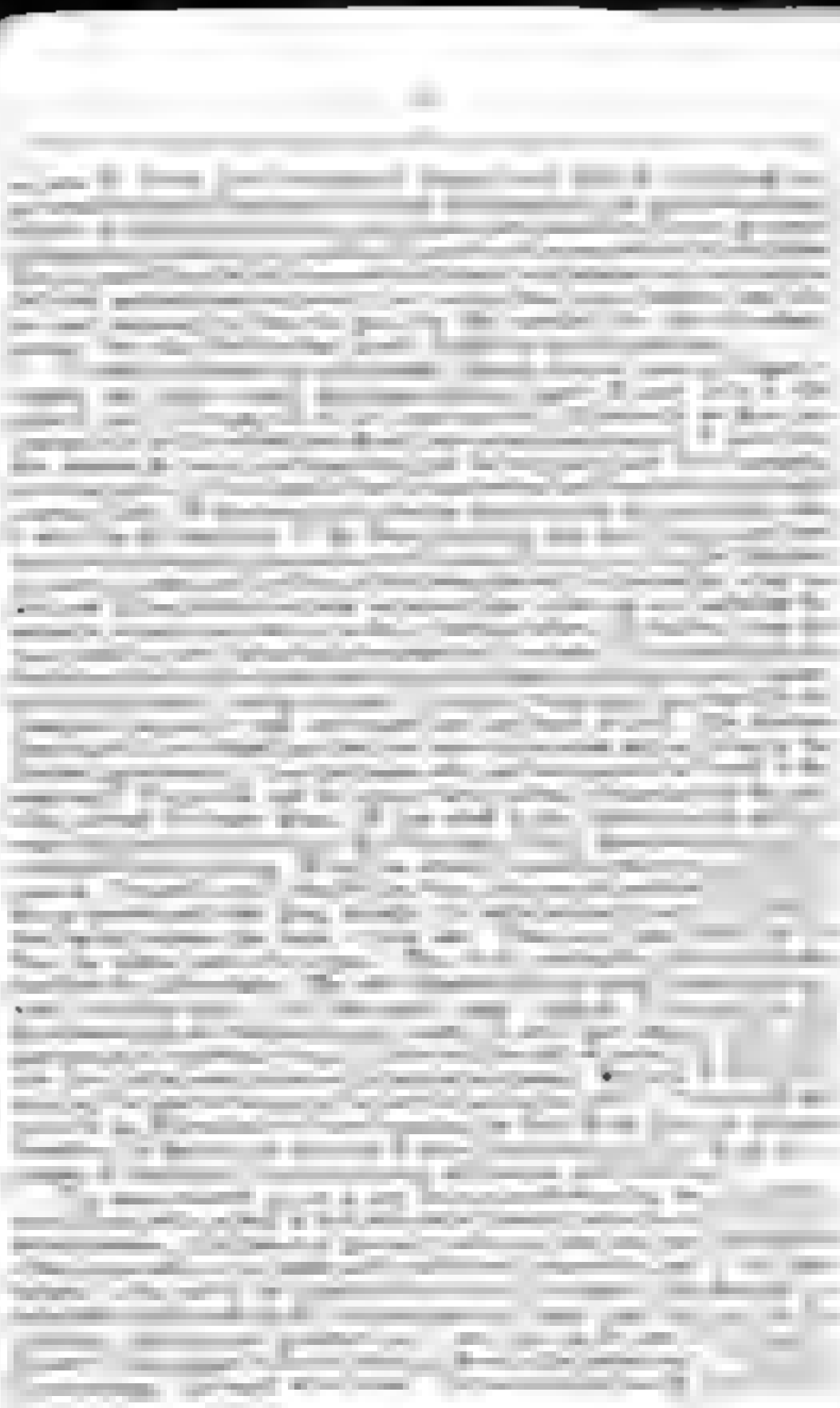
The commissioners say, in concluding their report:—

decided

feasible?

If it be, what shall be the area of the

Fourth—How shall the lands that ought to be included owned by the State, be acquired?



gh the timber dealer and the lumberman

to be marketable in about fifteen y

preserved from fire, be reclaimed by the forest

found to exist upon them

4,000,000

nd which shall also be a sanitarium for invalids

y recommended that the legislature should enac

THE ADIRONDACK PARK ACT

respecting the Adirondack Park, is as follows:

The people of the State of New York represented in Senate and Assembly do enact as follows —

timber supply

trees of soft wood with a diameter of less than
from the ground, or subject to any rights, l
mber after the period of ten years from the date of the

t, whi

of the land office

of the land office to be treated as part of their ex

as provided in section four

expenses of the forest commission

be granted to any such lessees

except as in this act otherwise provided and the forest

mitted upon any part of the forest pres

as are or shall be provided by law

(14) This act shall take eff ately

PUBLIC UTILITY OF THE PARK

It is immaterial whether it be called a park or forest preserve, and its use

wait until it is removed and then attempt to buy the land

ht trees to the acre. Their removal would not affect th

ment furnish future revenues to the State

the State give permission to persons desirous of building

to persons of moderate means as well as to the wealthy

magnitude of the interests involved

But there are more important reasons for the establishment of a
on the Catskills. A portion of the preserve is in close proximity
cities of New York, Brooklyn, and the many cities along the Hudson
easily accessible to the majority of the population of the State, and

country ; but the officers of the commission were unable to obtain any clue whatever to the perpetrator of the crime.

"Another incendiary fire was started in Franklin County, near Loon Lake May 2nd, a full report of which was made by Forewarden Chase, who is found on a subsequent page.

The miscreants who start these fires have every opportunity for accomplishing their work without fear of detection. They enter the forest alone and unobserved, start a fire and then aided by their knowledge of the wilderness, emerge at some point many miles distant. These incendiary fires are the cowardly means resorted to by revenge for fancied wrongs, and it is an unpleasant fact to contemplate that in certain localities the forest is at the mercy of any lawless man, who brooding over imaginary grievances or inflamed by ignoble passion or envy, seeks to gratify a revengeful spirit by this direct resort. We need not leave far in the Adirondacks before the camp will catch the unconcerted muttering and significant threats which leave no doubts as to the danger from this source.

From the table given it appears that of eighty-nine fires reported, the causes were:

From clearing land	22
From railroad locomotives	10
From railroad track hands	3
From hunters and fishermen	9
From mischievous boys	5
From incendiaries	4
From camp fires	3
From mosquito smudge	1
From tobacco smoking	3
From sparks from saw-mills	1
From causes not stated	14
From causes unknown	14
Total	89

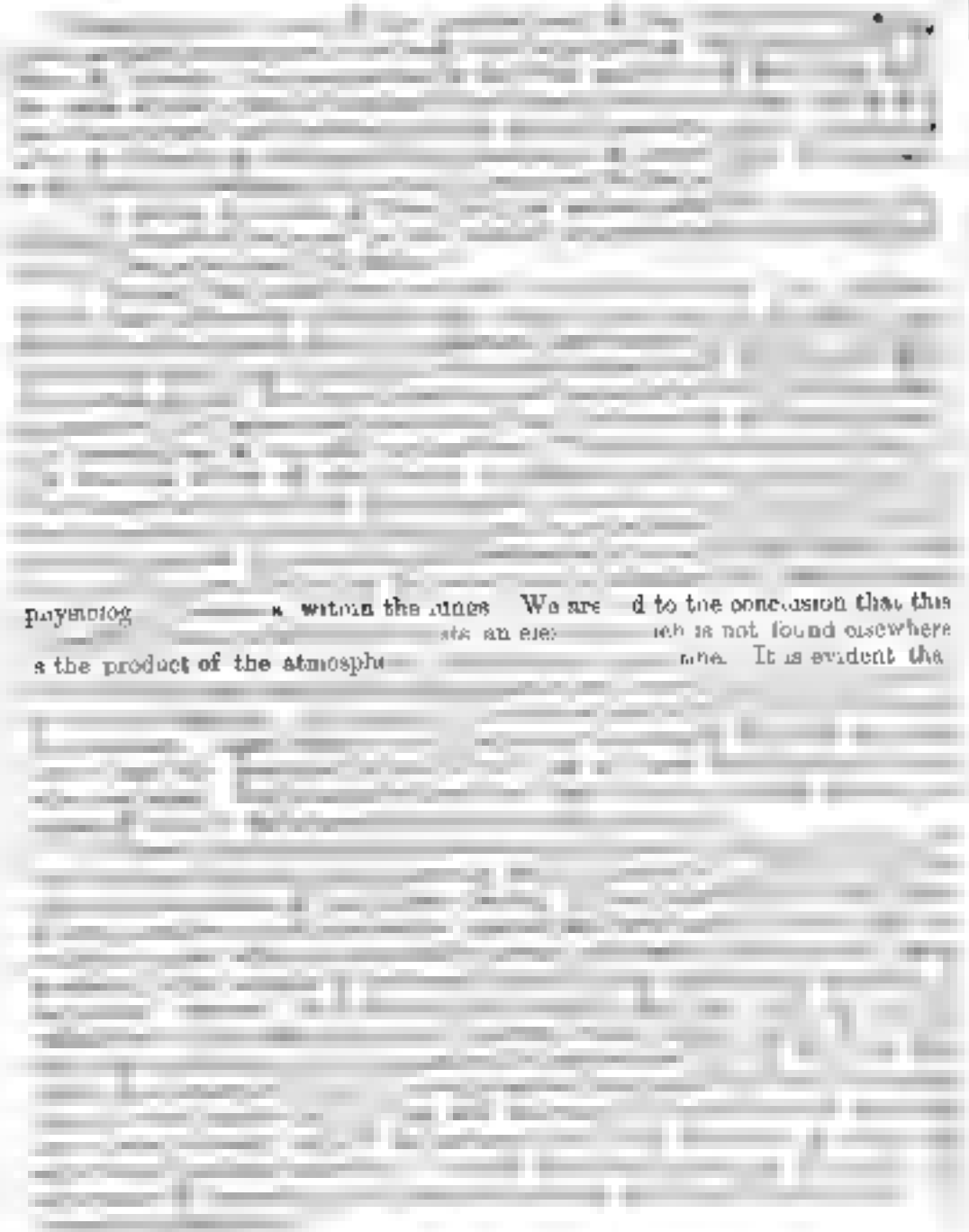
SANITARY BENEFITS OF THE ADIRONDACKS

The advantages of the Adirondack Park as a health resort are becoming recognized. On this point the commissioners in their report for 1891 have the following:

"Information regarding the sanitary benefits of the great forest is so largely sought after that at the risk of repetition, we quote from one of our previous reports:

The sanitary value of our forests cannot be over-estimated. In addition to their furnishing a summer resort for the over crowded population of our towns and cities, a place where rest, recuperation and vigour may be gained by overtaxed nervous and over-worked people, the healthful and purifying influence of coniferous forests has been thoroughly established.

"The testimony based on personal careful and scientific investigation of such men as Dr. E. L. Trudeau of Saranac, cannot be overlooked. Himself an invalid restored to health by forest life, he has devoted himself to the question of environment in its relation to tuberculosis, and by experiment in living animals, has demonstrated the value of the terebinthine forests of the Adirondack region as a factor in warding off pulmonary diseases. He says:



paynnog ——— s within the rings We are ——— d to the conclusion that this
——— sts an ele——— ieb is not found elsewhere
s the product of the atmosphe——— ——— ane. It is evident tha

THE CUTTING OF TIMBER FOR PULP WOOD

anufacture of paper from wood is a comparatively new industry

xpens

nt of timber used for this purpose has increased 500 per cent

ote but the fact that the entire amount consumed is taken from

valuable

epu

the Black R wood w of meter as low as three inches It wil
seen that the introduction ood pulp, while it might be a valuable facto
n economic forestry under proper management a l restrictions, now indicates a
speedy extinction of the conifers

of the pulp timber cut in Lewis and St[illegible] Counties is peeled before it is

not nec[illegible]

[illegible] pails, barrels, kitchen ware, coffins

pulp is also used to some extent in the manufacture of [illegible]

Prof B E. Fernow of the Forestry Bureau at W[illegible] s report — 'While the use of timber has b[illegible]led in ship building the latest torpedo ram of the Austrian navy r[illegible]ved a protective

and water proof for covering and finishing [illegible]

Of the seventy five [illegible] sixty four mills draw their entire supply from [illegible] New York or what is known as the Adirondack woods

SPONTANEOUS RENEWAL OF THE FOREST

Where the efforts of nature are not thwarted by the ra[illegible] of fire, the tendency of the forest is to re-assert itself. The c[illegible]ssioners note that this is easily as for instance in the operations of charcoal-burners

p. 113)

outlook for the future welfare of these forests" (p 162

of the stumps left by the charcoal axemen
sprouted persistently yielded a second growth exhibiting most of t
nal varieties so far as deciduous trees are concerned But where th
has been destroye successive burnings the soil and seeds are too badly

ural reforestation" (pp 169 170

vigorous growth of spruce and balsam

already sane. The time is near when the propagation of this variety of pine must enter largely into our forest management

"The tract of second growth white pine just referred to lies along the road that runs from Minerva through the Hoffman Township within and near the south eastern boundary of the park. The land was once cleared and used for farming purposes but it was abandoned and it is now overgrown with a thrifty crop of conifers. Had these lands been denuded by fire instead of farming the resulting crop of trees would have been of a different kind. Poplars and pin cherries would probably have appeared in that case. The fire burns into the ground and destroys every hidden seed. Other seeds distributed by well known agencies are subsequently deposited on the sand surface of which the poplar and bird cherry are the only ones that will germinate in the then unfruitful soil." (pp. 197 8)

report for the year 1890, makes the following remarks —

[redacted]

ain stones were at an elevation of from 6,000 to 10,000 feet,

[redacted]

truly mystic land

[redacted]

muskrat, etc., birds, fishes, reptiles, and insects

Timber of the Park

quality of its timber

a statelier tree and more valuable for timber or lum

"Red fir is the next size (which nearly equals that of the Norway pine of Mich

in all except the very elevated regions

small timber rafters, fence poles, etc

grassy slopes, just below the mountain snow

Cedar of a red or spotted variety growing l w and very branched but with timber valuable for fence posts, is abundant

Poplar or aspen is found in dense thickets sheltered foot lls

varieties being for the food use of beaver or for bu

Act of Dedication

Yellowstone River as a public park

States, and dedicated and set apart as a public park

preservation from injury or spoliation of all timber mineral

for

the objects and purposes of this Act

Approved, March 1st, 1872

and the care of same generally are the following

Its boundaries

and. Persons residing within the park, or visiting it for any purpose what

s to extinguish all fires, which it may be

necessary to make. before he No fires must be made within the park

necessary purposes

the

superintendent, is strictly prohibited

No person will be permitted to reside permanently within the limits of the park without permission from the Department of the Interior and any person

f residence

NOTE.—These rules and regulations are those adopted by the Hon. C Delano, Secretary of the Interior at the dedication of the park

Additional rules subsequently issued are

the displacement of the same from their natural condition

s may be required for shelter an

control

by the party requiring their use

ts, are prohibited by law, and no sales of game or fish

shall vacate the premises within forty days after being notified in writing so to do by the person in charge notice to be served upon him in person or left at his place of residence

(6) *The sale of intoxicating liquors is strictly prohibited*

out the the objects and purposes of this Act

Approved

S J KIRKWOOD P W NORRIS

AN ACT TO ESTABLISH A PUBLIC PARK IN THE STATE OF CALIFORNIA AS A PUBLIC PARK

[illegible]

[illegible]et thereof, except as hereinafter provided, shall b[illegible]

Section 2. That said public park shall be under the exclusi[illegible]

[illegible]r profit. He shall also cause all persons trespassing u[illegible]

sufficient store of what in all ages has been regarded as a p

w of King Ina it was enacted, that if anyone set fire to a wood
shoul

offender was to be mulcted three pounds

farmer was permitted to fell a tree, unless he could mak

to kill cake or hunt within his own ground, and if anyone did s

ab
ed

rum forestæ chiefs or earls of the forest

(2) Let there be under each of these, four of the middling

6 7 8) Relate to oath

the forest

wood, or underwood, without leave of the chiefs of the forest which if any one do, he shall be adjudged guilty of an infringement of the royal chase

pay to the king twenty shillings

to have

and all the privilege of royal forests

laws of Canute were afterwards confirmed by

are, built, by forming the Magna Charta with King John

The Magna Charta of 9th Henry III., Chap. 21 was the *Carta de Foresta* of February 10. 1225

cutting of wood appears to have been considerably felt

The 12th of Edward the III., Chap. 1 and 2, g rable liberty for cutting and carrying wood, but it was to be done within view of the keepers of the forest

forests, but they are principally modifications of former acts

might be fenced when dead on the top

.he carfs and if named one to be marked one, and to be sixteen

to be seventeen inches and a half in girt, and every bi et of on

and ordered that the fagots should be every stick thre

of the same size as required by the Statutes for
7th of Edward VI. is an Act for previ
foreste, etc nforms the 38th of Henry V

sea or of the River Thames, Severn, Wye, Humber, Dee [illegible]yne, Tees, Trent, or any

the words of Kent, Surrey and Sussex

not above eight hundred

[illegible]ted, pan-

[illegible]oal mines and grindstone quarries may be leased

and vagabonds

under the penalty of £5

the end of the next

officer where the stores are landed"

to wood is made f

Sec. 17 of Chap. 2, 8th of George I directs particular examination into the quality of Scotch tar

real of

same as enacted by Anne, but the penalty is reduced

burn
in the
bidde

make
caused
year,

aformer, and the other to the poor of the parish

planting timber treas.

greate woodes nor forestes

3) Statutes, James V, 4th parliament, 7th June, 1535

burneing after the moneth of Marche quhir an cornes be schorne. under the paine of fortie shillings, to be raised to the ord of the land of the burner, etc.

Su bsequent Acts were 10 James III Chap. 75 Anno. 1477 4th James IV, Chap. 48 6th James IV Chap. 7. 6th James VI Chap. 84.

There are also several British statutes regulating the time for making muir-burn. The 6th George III proceeds thus "And whereas the laws now in force in that part of Great Britain called Scotland for preventing muir-burn in forbidden time are found defective and insufficient, whereby not only the game, but *also many valuable woods and plantations have been destroyed* for remedy whereof, be t enacted, by the authority aforesaid that no person or persons shall make muir burn, or set fire to any heath or muir in that part of Great Britain called Scotland, from the last day of March to the first day of November in any year under the penalty of 40s. lawful money of Great Britain, for the first offence, etc. This Act was amended by 13 George III Chap. 54, sec 3.

FOREST LANDS OF THE UNITED STATES

n fu l

purposes, submit the followin

n 70,000,000
acres of public domain which is designated as timber or woodland, mostly

sed

small amount in Michigan, Louisiana, Mississi

rs, and redwoods) and mostly in eastern regions

racticable system of management by which the timber
thout detriment to the future condition of the forest

be enforced

the entryman and immediately transferred to lumber co n foreigners, and immense tracts are being thus held for the same m nons that have exhausted the forests of the east

Government either timber or timber-bearing lands—

pre-emption laws are usually a mere pretense for getting the timber. Com

perhaps not one in 5,000 of what may be mineral is known to be such

illegal and wasteful cutting

The worst damage of these fires is not so much to be sought in the destruction of the standing timber but in the destruction of the forest floor by which the chance for germinating of seeds and natural reforestation is annihilated, and the water regulating capacity of the forest is destroyed.

As to the amount of depredations, the following table, prepared from reports of the Land Office, is instructive, not only in showing the enormous amounts thus lost to the public treasury, compared with which the cost of a well organized administration would be a mere bagatelle, but also by corroborating the statement that the loss is rarely recovered in the courts.

It should also be borne in mind that the cases reported do not by any means cover all cases of trespass, presumably only a small part, since the number of agents is small but the cases are ridiculously out of proportion to the area to be covered.

DEPREDATIONS ON THE PUBLIC TIMBER DURING ELEVEN YEARS

Year	Estimated value of timber reported stolen.		Amounts actually recovered, per year compromise	Appropriations for protection service	Agents employed calculated on the basis of twelve months each per annum.
	Market.	Stumpage			
	$	$	$	$	
1881	391,688	225,473	41,630	45,000	17
1882	2,044,278	51,.080	7,365	45,000	31
1883	6,144,654	700,834	27,741	70,000	36
1884	7,931,484	..031, 78	62,168	65,000	26
1885	2,887,530	489, 50	43,451	75,000	25
1886	2,138,673	1,726, 06	101,087	75,000	21
1887	6, 16,135	1,122,229	128,143	90,000	24
1888	8,397,500	940,145	128,522	75,000	25
1889	2,186,534	1,132,387	11,102	75,000	23
1890	5,067, 42	852,420	100,312	75,000	29
1891	2,347,475	349,441	16,704	100,000	33
Total	54,125,421	10,098,827	1,009,243	780,000	*25

§ It is a well-known fact, demonstrated by European experience and practice, that by a proper system of cutting not only can a forest be reproduced without the necessity of expensive replanting and kept continuously productive, but its yield per acre and year in quantity and quality can by proper management be increased considerably beyond that of the virgin forest left without management.

The methods of management for natural reforestation, or "regeneration methods," are practiced especially in France and Germany in broad-leaved as well as coniferous forests. The cutting of the old timber is done with a view of giving chance for seeds of the desirable species to sprout and for the young growth to develop satisfactorily. These methods prove especially in the mountain regions, where planting would be expensive and sometimes impracticable.

Since in the well-managed forests only such species as are valuable are allowed to grow to the exclusion of the inferior kinds which the forester treats as weeds, the composition of the forest is improved, the growth is kept at the

*Average.

is beyond any average computation

congress at Nashville, Tenn., in 1892, says —

timber land except on the Pacific Coast, in fact he would be afraid to assert one-

10,000 feet board measure

cubic feet round

duction of our present forest area

annual growth is
ood is that much

f 20,000,000,000 cubic feet—we need

owth. What do these figures mean with reference to the subject in question

swing reduction of standing timber supp
l, which cannot fail to occur soon. Th

having marketed their best supplies at unprofitable and

Nevertheless, it may be possib

s cover and finally the mechanical retardation of the

was an unfortunat

to be in the ratio of 5 to 8

perature in early spring with steep declivities and impermeable rock formation

and high stages

forest cover prev erosion of the soil and formation of
detritus of rocks, gra and sands which carried into the rivers increase th

torrents

the method of obviating it.

direct or indirect

lands, therefore, from the undesirability of destroying or unnecessarily

duced on land otherwise useless, there is strong reason especially in regions favorable forest

conditions should be carefully maintained

floor

In this connection it will be well to language from a
rial recently transmitted to the Pres tes by the Colo

reservation of all the timber lands in their State

To His Excellency the President of the Uni

respectfully represents that the
portance is almost entirely

distribution of water No less than 13,000

ing States and Territories. New Mexico would be uninhabited
waters of the Rio Grande, which flow from the snow mountains of C

prudent and economical use of the forest resources

for 1891 :—

WATER MANAGEMENT THE PROBLEM OF THE F

[illegible] ...ut of what would ... [illegible]
dra... ...nged into surface-drainage waters. At the same time, by this ... [illegible]
the soil, capillary action is increased and evaporation from under ...
soil, carrying these in their descent ...

Here it is that water management and ...
ment should be studied for ...without forest ...

... *United States has shown that under private owner...* ...*ed or deteriorated, for the*
simple reason ...
enterprise recognizes in the f...est not being concerned in the future or in the consequences of ...management.

It is therefore undesira... ...o transfer the ownership of the public timber ...
view to the ... ...nterests of the commun...y ...

If there w... ...
of the eastern forest lands, which have ... for many years in the hands of private owners we need only ...fer back to the working o... ...he law in the Pacific Coast States, where such disposa... to private holders has utterly failed in accom... ...plishing its object ...
found among the many to ...et us anticipate forest management by small holders ... from financia... as well as technical consi... ...

It w...ll be ... ...
the same that ...
government ... ...
the others to follow ...

The fact that a tree crop takes from fifty to one hundred years and more to ...
people have ... ...
... where needed, as in our forest policy ...

... *as with*
a view of having the States devise methods of co... ...rative management, would ...
fail on ... ...complishing the object for ... Experience in the past ...
...essions has not prov... ...d practicable to place restrictions or conditions ...
...on such cessions or to enforce them.

Even if a cession, upon condition that the ... ...ate provide efficient manage... ... practically effected, lack of unity in the various systems and clashing of interests where waters... ...ds are situated in more than one State, mak... retention of these lands in the ...eneral government desirable, or at least more promisin... of conservative results ...

Other reasons of ex... ... ...
impracticable ...
timber lands from public lands of oth... ...descrip...n or transferring obligations of the general ...vernment toward rail...ad companies, ...

Neverth... ... ...
... ...
whatever met... ...general government ma... devise ...

(9). The present proposed legislation keeps in view the following principles ...
...e retention of the public timber lands in the gen...l governmen...
and their a... ...nistration as such as th... only proper p... for all wooded areas ...
of the pub... ...do not ado... agricultu...

plish the objects of a rational forest policy

itself by the sale of surplus forest

government forest administration

expenses. A rough estimate of this question may be

charge for stumpage is taken at 10 cents

And in another place (see Annual Report, 1886) :—

(7) The cost of the total service depends of course on the districts to be formed [illegible] about 5,000,000 acres of public domain. For

an equal amount

$.0,858,893 in 1870

[illegible] expended :—

[illegible] salaries to the amount of	[illegible]
681 district officers or managers	[illegible]
5 underforesters or guards	[illegible]
114 financial agents	[illegible]
Other temporary employés and personal expenses	[illegible]
Total personnel	[illegible]
[illegible]	[illegible]
Roads and water ways	[illegible]
Surveys	[illegible]
Injurious insects	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
Total salaries and administration	$9,000,932
Forestry schools and scientific research	$ 48,430
[illegible]	[illegible]
[illegible]	[illegible]
Grand total	[illegible]

Or $1 35 per acre, leaving a net revenue of $1 30 per acre, as against 97 cents in 1870, when the expenditure per acre was 24 [illegible]

(6) *The proposed* [illegible] *that are stocking on non-agricultural soil from* [illegible]

[illegible]

[illegible]

[illegible]

the upholding of a rational forest policy

[illegible]

[illegible]

[illegible]

[illegible]

[illegible] The attempt [illegible] of regulating the [illegible] of water have come and [illegible] the lack of [illegible] system, and if the [illegible] to maintain a system

[illegible]

[illegible]

[illegible] of the public domain at least

[illegible]

There is another subject, Mr President, [illegible] so that interest as to demand consideration [illegible] I refer to the preservation [illegible] to teeming millions.

We have ourselves heretofore sadly neglected these [illegible] not and must not much [illegible] injuring his own propert[illegible] rough intelligent legislatio[illegible]

[illegible]

[illegible] bill is recommended

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Ontario. Royal Commission on
Forest Reservation and
National Park

DEC 10 1992

ONTARIO ROYAL COMMISSION ON FOREST RESERVATION & NATL PARK REPORT

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PAPERS AND REPORTS

UPON

FORESTRY, FOREST SCHOOLS,

FOREST ADMINISTRATION AND MANAGEMENT

IN

EUROPE, AMERICA, AND THE BRITISH POSSESSIONS,

AND UPON

FORESTS AS PUBLIC PARKS AND SANITARY RESORTS

COLLECTED BY

MR. A KIRKWOOD,

(Chief Officer of the Lands Branch of the Department of Crown Lands) under the direction of the Commissioner of Crown Lands,

TO ACCOMPANY THE REPORT OF THE ROYAL COMMISSION ON FOREST RESERVATION AND NATIONAL PARK.

PRINTED BY ORDER OF THE LEGISLATIVE ASSEMBLY

TORONTO:
PRINTED BY WARWICK & SONS, 68 & 70 FRONT STREET WEST
1893.

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INTRODUCTION.

"A great State was a desert, and the land
Lay bare and lifeless under sun and storm,
Treeless and shelterless. Spring came and went,
And came, but brought no joy, but, in its stead,
The desolation of the ravening floods,
That leaped like wolves or wild cats from the hills,
And spread destruction over fruitful farms;
Devouring as they went the works of man,
And sweeping seaward Nature's kindly soils,
To choke the water-courses worse than waste.

"The forest trees, that in the olden time—
The people's glory and the poet's pride—
Tempered the air and guarded well the earth,
And, under spreading boughs, for ages kept
Great reservoirs to hold the snow and rain,
From which the moisture thro' the teeming year,
Flowed equably but freely—all were gone.
Their precious bales exchanged for petty cash,
The cash that melted and had left no sign,
The logger and the lumberman were dead,
The axe had rusted out for lack of use,
But all the endless evil they had done
Was manifested in the desert waste.

"Dead springs no longer sparkled in the sun,
Lost and forgotten brooks no longer laughed,
Deserted mills mourned all their moveless wheels
The snow no longer covered, as with wool,
Mountain and plain, but buried starving flocks
In Arctic drifts, in rivers and canals
The vessels rotted idly in the mud,
Until the spring flood buried all their bones,
Great cities that had thriven marv'lously,
Before their source of thrift was swept away,
Faded and perished, as a plant will die
With water banished from its roots and leaves,
And men sat starving in their treeless waste,
Beside their treeless farms and empty marts,
And wondered at the ways of Providence."

THE UTILITY OF FORESTS.*

The effects of forests may be looked at from the point of view of the owner or from that of the State. The owner considers in the first place the benefits which he personally derives from his forests; the State appreciates the effects which they have upon the country and the nation as a whole.

The important direct effects of forests are due to the produce which they yield, the capital which they represent, and the work which they provide.

Wood is used as timber in construction, ship-building, machinery, agriculture, for house furniture, etc., and as fuel for domestic and industrial purposes. The quantity of wood required in a country depends on various considerations. In modern times iron and other materials have, to a considerable extent, replaced timber, while coal, lignite, and peat compete with firewood; nevertheless, wood is still indispensable and likely to remain so. The more general introduction of substitutes for firewood has however drawn increased attention to the production of timber in preference to firewood. For instance, of the total produce of the Saxon State forests only 35 per cent were classified for timber in 1850, but the proportion has risen to 77 per cent in 1880. At the same time new demands for the consumption of wood have sprung up, such as the preparation of wood-pulp for the manufacture of paper. It is estimated that the annual consumption of wood in this industry in Germany alone amounts to upwards of 80,000,000 cubic feet.

Forests as Objects of Industry.

The capital employed in forestry consists principally of the soil and the growing stock of wood. When the working is of an intermittent nature the amount of capital fluctuates from time to time; when the working is so arranged that an equal annual return is secured the capital remains of the same amount, and consists of the soil plus the permanently present growing stock.

The soil is called the fixed, the growing stock the movable or shifting capital of forestry. The proportion of the one to the other depends chiefly on the method of treatment. In forests treated as coppice woods the fixed may be greater than the movable capital; but in high forests where the object is to produce timber of some size the shifting capital is generally of considerably greater value than the soil. An example will illustrate this. Assuming that an area of one hundred acres is treated as a Scotch pine timber forest under a rotation of one hundred years with the object of obtaining an annual yield return, in that case one acre must be stocked with one year old seedlings, another with two years old seedlings, another with three years old trees, and so on to the last acre which would be stocked with trees one hundred years old. Every year the oldest wood, one hundred years old, is cut over, and the area at once restocked. Immediately after the cutting ninety-nine acres remain stocked with trees ranging in age from

* A Manual of Forestry. By William Schlich, Ph.D., Principal Professor of Forestry at the Royal Indian Engineering College, Cooper's Hill, England. [In Subsequent appointment of twenty years in the Forest Department of the Government of India, and successively Surveyor-General, Conservator, and Inspector-General. On his return from India he was appointed Professor of Forestry at Cooper's Hill College.]

one year to ninety-nine years old, and this is called the normal growing stock. Without the presence in the forest of this series of age gradations it would be impossible to obtain a regular annual yield of trees one hundred years old.

The subjoined table gives the capital invested in a forest worked upon the principle of a sustained annual yield. The data for the growing stock are taken from the Yield Tables for the Scotch Pine, by M Weise converted into English measures. In calculating the value of the growing stock it has been assumed that fagots would not yield any money return, and that timber, including all pieces of three inches diameter and upwards at the thin end, would yield two pence per cubic foot under a rotation of thirty years, gradually rising to five pence per cubic foot under a rotation of one hundred and twenty years. Soil adapted for the growth of Scotch pines is generally light, and the value of such land of the I. or best quality cannot, on an average, be estimated at more than £25 per acre, while land of the III or middling quality may be estimated at £12 per acre, and land of the V or lowest quality at £4, though land of the latter quality is not worth more than a few shillings per acre.

CAPITAL INVESTED IN FORESTRY POUNDS STERLING PER ACRE.

Length of rotation in years.	I. Quality best.			III. Quality middling.			V. Quality lowest.		
	Land.	Growing stock.	Total.	Land.	Growing stock.	Total.	Land.	Growing stock.	Total.
	£	£	£	£	£	£	£	£	£
30	25	3	28	12	2	14	4	1	5
40	25	17	42	12	7	19	4	3	7
50	25	26	51	12	12	24	4	5	9
60	25	35	60	12	17	29	4	8	12
70	25	45	70	12	22	34	4	11	15
80	25	56	81	12	28	40	4	15	19
90	25	68	[illegible]	12	35	47	4	20	24
100	25	80	105	12	42	54			
110	25	93	[illegible]	12	50	62			
120	25	106	131	12	58	70			

1). This table shows that the capital increases with the length of the rotation.

(2) That the value of the growing stock is at first smaller than the value of the land, equal to it under a rotation of from forty to fifty years, and greater after that period.

(3). That the capital invested in timber forests is considerably greater than that of the land only

Precipitations or Rainfall.

The question whether, and in how far, forests affect the rainfall is one which has been actively discussed for many years past, but so far no final decision has been possible. That forests can affect precipitations follows from the facts that forest air is relatively moister than air in the open and that the trees mechanically affect the movement of the air, but, on the other hand, the rainfall depends chiefly on other much more powerful agencies, in comparison with which the effect of forests is small. Numerous comparative observations have been made, but only a certain portion has so far been published and unfortunately those which seem to indicate a decided effect of forests on the rainfall are not always very reliable. The great difficulty in comparing the results of observations at forest stations (that is to say stations situated inside a forest) with those of the ordinary meteorological stations consists in the fact that elevation above the sea affects the rainfall most powerfully because air cools on rising and precipitations become more frequent with elevation.

Although further observations are necessary before a final conclusion can be arrived at, the following data may prove interesting:—

In the Prussian system the forest stations have shown the subjoined increase of rainfall over the average rainfall of the open country as taken from the ordinary meteorological stations:

Excess of rainfall in forest station over that of open country, in per cent. of the latter rainfall—

Between sea level and	328	feet	elevation	..	1·25	per cent.
" 328 and	556	"	"	.	14·2	"
" 1,969 "	2,297	"	"	. . .	19.	"
" 2,297 "	2,625	"	"	. .	48.	"

Although these figures may not represent the absolute facts of the case, they seem to indicate that in the plains forests have very little effect upon the rainfall, if any at all, but that their influence becomes considerable with increasing elevation in mountainous countries.

The results of seven years' observations made at two stations near Nancy show a decided increase of rainfall in the forest. The stations are situated 1,247 feet above the sea, one in the middle of an extensive forest five miles to the west of Nancy, the other in an almost woodless country six miles to the north-east of Nancy.

The results were as follows:

Increase of rainfall in forest over that in the open in per cent. of the latter—

February to April	7 per cent.
May to July	13 "
August to October	23 "
November to January	21 "
Mean of year	16

Evaporation.

Owing to the lower temperature, the greater humidity of the air, and the quieter state of the atmosphere, evaporation must be considerably smaller in

forests than in the open. This has been conclusively proved by direct observations. Those made in Bavaria and Prussia show the following results :—

Stations.	Quantity of water evaporated from a free surface of water, height in inches.			Less in forest expressed in per cent. of the total quantity evaporated in the open.
	In the open.	In forest.	Less in forest.	
Bavarian.	23.53	8 61	14 92	-63
Prussian .. .	13.16	5.98	7.18	55
Mean	18 34	7 29	-11 05	-60

These data show that evaporation in the forest was only two-fifths of that in the open country

The effect of this action is that of the water which falls on the ground in a forest a considerably larger proportion is secured to the soil than in the open. That water is available to be taken up by the roots, while any balance goes to the ground water and helps to feed springs. Of considerable importance in this respect is the covering of forest soil. Dr Ebenmayer's observations on this point, extending over five years, show the following results :—

Water evaporated from soil in the open.	100 parts
Evaporation from forest soil, without leaf mould .	47 "
" " " with full layer of leaf mould ...	22 "

In other words, forest soil without leaf mould evaporated less than half the water in the open, while forest soil covered with a good layer of humus evaporated even less than one-fourth of that evaporated in the open.

The result of these peculiarities is that, at any rate up to a certain elevation, the forest soil retains, after allowing for evaporation, more water than open soil, although some 23 per cent. of the rainfall are intercepted by the crowns of the trees In order to illustrate this the following table, taken from Dr Weber's calculations, is inserted, as it shows the balance of rainfall over evaporation according to elevation , it is based upon Prussian observations :

Altitude of stations in feet.	Excess of rainfall over evaporation in inches.		Percentage of rainfall which evaporated.	
	In the open.	In forest.	In the open.	In forest.
0— 328	12 02	12 32	55	37
328— 656 . ..	12.69	13 24	53	30
984—1,312 . . .	12 20	17 65	58	25
1,969—2,297	36.96	30 79	32	13
2,540	47 10	43 08	15	9
3,050	56.77	46.34	19	11

This table shows that the balance of water retained by the soil increases rapidly with altitude, and that the evaporation in mountain forests may be reduced to about 10 per cent of the rainfall. If it be remembered that the moisture is most effectually preserved in forests, it will easily be understood why the mountain forests have from time immemorial been looked upon as the preservers of moisture and feeders of springs. No doubt, a certain portion of the water is again taken out of the ground by the roots of the trees and evaporated through the leaves. The quantity thus consumed is not known at present, but it cannot be more than 12 inches, the total quantity available in plain forests, and probably it becomes less with elevation, so that a considerable balance remains available in hill forests for the feeding of springs.

Mechanical Effect of Forests.

The mechanical effect of forests makes itself chiefly felt in regard to the distribution of the rain-water, the preservation of the soil on sloping ground, the binding of moving sand, the prevention of avalanches, and the moderation of air currents.

(a) *Feeding of springs and rivers.*

Most of the rain-water falling on a bare slope rushes down into the nearest water course in a comparatively short time, thus causing a rapid rise in the level of the stream. Only a comparatively small portion sinks into the ground, so as to become available for the feeding of springs. Of the rain falling over a forest, close on one fourth is intercepted by the crowns of the trees and the other three-fourths fall upon a layer of humus, which possesses a great capacity to absorb water and to retain it for a time. It has been shown, for instance, that mosses of the species *Hypnum*, which grow under the shade of conifers, can absorb up to five times their own weight of water and peat mosses of the genus *Sphagnum* up to seven times, while the leaf mould to be found in a middle-aged well-preserved beech wood can absorb and retain for a time a rainfall of five inches. Part of the water thus absorbed penetrates into the ground and becomes available for the feeding of springs, while the rest gradually finds its way into the nearest stream. In this manner well-preserved forests must have a decided effect upon the sustained feeding of springs, and the moderation of sudden floods in rivers. When, however, the humus has been saturated with water and rain continues, the effect of forests as regards inundations must cease, because the additional water follows the laws of gravity, and finds its way into the valleys.

(b) *Protection of the soil.*

Water rushing down a bare slope possesses a great mechanical power, by means of which it loosens the soil and carries it down hill. In this way landslips are often caused, ravines are formed, and fertile land situated at the foot of the ravine may be covered with silt and rendered valueless. Frequently the *debris* collects in rivers and forms obstructions, which are followed by a diversion of the bed and erosion of fertile lands. The rate at which this process proceeds depends on the geological origin and the formation of the surface, the less binding the soil and the looser the formation the greater will be the damage. If on the other hand, such a slope is covered with a well-preserved forest the roots of the

trees and the layers of humus keep together, and protect the soil against the action of water, besides the crown intercepts and retains, at any rate for a time a considerable portion of the water. On the whole a series of obstacles are opposed to the movement of the water which reduce its velocity and force or at any rate divide it into numerous small channels. The beneficial effect of tree-vegetation in this respect can be observed in most mountain ranges, and especially in the Alps from France to Austria. Wherever, in these parts, extensive deforestations have taken place the consequence has been the gradual formation of a series of torrents, in all places where the surface did not consist of hard rock, the *debris* brought down has covered more and more fertile land at the base of the torrents, and this evil has grown to such an extent that not only in France but also in the other Alpine countries great efforts are now made to re-afforest the denuded areas at a great outlay. When once the evil has been created immediate afforestation is not possible, it must be preceded by the construction of dams, dikes, walls etc. to steady the soil until the young forest growth has had time to establish itself and once more to lay hold of the surface soil. Forests protect the soil not only in the hills, but also in low lands wherever it consists of so-called moving or shifting sand along the sea coast as well as in the interior of countries. The action in this case is due partly to their moderating the force of the air currents and partly by keeping the soil together through their roots, by the formation of humus and the retention of moisture. In this way the Landes of France have from a dreary waste been converted into extensive forests intersected by cultivated fields.

(c) *Protection against air currents*

Forests break or moderate the force of air currents, and in this way afford protection to lands lying beyond them against cold or dry winds. Woodlands afford also shelter to game and useful birds. Their importance in this respect should not be overlooked, the presence of birds, which are the great enemies of injurious insects, depends often on that of woodlands.

Hygienic Effects of Forests.

Forests, in forming a substantial part of the vegetation of the earth, are an important agency for the production of oxygen obtained by the decomposition of carbon dioxide. Direct observations have also shown that forest air (like sea air) is much richer in ozone than the air of open countries, and especially of towns.

If forests then, produce oxygen and ozone and protect human habitations against injurious air currents, they may exercise a beneficial effect upon the healthiness of adjoining lands. Instances are not wanting where forests are said to have given protection against the germs of malaria but there are others where they are said to have had the opposite effect. As far as India is concerned, in some cases the medical authorities of military cantonments ordered forests to be planted and in others to be cut down. Whether certain species, such as eucalyptus, really possesses the quality of drying up soil, and thus remove swampiness, has yet to be proved.

No general rule can be laid down showing whether forests are required in a country or what percentage of the area should be so used. The forest question

must be determined on the special circumstances of each country By way of illustration the areas at present under forest in a number of countries are shown in the following table

Countries.	Area under forest, in acres.	Percentage of total area of country under forest.	Forest area per head of population, in acres.	Distribution of forest area, according to ownership, in percentage of total forest area.		
				State and crown forests.	Forests of corporations, endowments, etc.	Private forests.
Servia	5,166,000	48	3 8			
Russia-in-Europe	527,427,000	42	6 1	60	40	
Sweden	42,356,000	42	9 1	20	80	
Austria proper	24,161,000	33	1 1	6	94	
Hungary	22,603,000	29	1 4	16	52	32
Germany	34,350,000	26	8	33	19	48
Norway	18,920,000	25	9 9	12	3	85
Turkey, including Bulgaria, Bosnia and Herzegovina	20,512,000	22	3 5			
Roumania	4,383,000	22	9			
Italy	14,395,000	22	5	4	43	53
Switzerland	1,930,000	19	7	4	67	29
Spain	21,345,000	17	1 3	82		18
France	20,750,000	16	6	11	23	66
Greece	2,026,000	16	1 2	80		20
Belgium	1,073,000	15	2			
Holland	554,000	7	1			
Denmark	477 000	6	2			
Portugal	1,166,000	5	2			
Great Britain and Ireland	2,790,000	4	1			
Total for Europe	766,324,000	21	2 5			
United States of N America	390,000,000	17	7 6			
East India, British	140,000,000	[illegible]	6	50	50	

The percentage of forest area varies from 48 to 4, and the area per head of population from 9 9 to 1 acres. This shows that the general conditions in the various countries must make different demands in respect of afforestation. Servia, Russia, Sweden and Norway may as yet have more forests than they require for their own population. On the other hand Great Britain and Ireland, Portugal, Denmark, Holland, Belgium, and even France and Italy have a smaller forest

area than is necessary to supply them with a sufficient quantity of forest produce. At the same time they are all sea bound countries and consequently subject to conditions which differ altogether from those found in continental countries. Most of them are under the influence of moist sea winds and all are favorably situated in respect of importation by sea.

Intimately connected with the area under forest in a country is the state of ownership. Forest owners in Europe may be grouped into the following three great classes:

(a) The State or the Crown.

(b) Corporations, endowments, etc.

(c) Private persons.

Where forests are not reserved on account of their indirect effects and where importation from other countries is easy and assured the government of a country need not as a rule trouble itself to maintain or secure forests but where the opposite conditions exist that is to say where forests are necessary to preserve climatic and mechanical effects and where the cost of transport over long distances becomes prohibitive a wise administration will take measures to secure the maintenance of a certain proportion of the country under forest. This can be done either by the planting or construction of certain areas of State forests or by exercising a certain amount of control over private forests. In most of those countries where corporation forests exist they are subject to the control of the State though the degree to which such control is exercised may differ. Private forests are free from control in some European States and subject to it in others. In all such cases the State is entitled to interfere when the welfare of the general community requires it. The extent to which interference may be carried depends on the special conditions of each country and on the proportions of the forest area belonging to the State. Thus of the Swiss forests only 4 per cent belong to the State while 57 per cent belong to corporations and 39 per cent to private owners; at the same time a large proportion of them are declared protection forests and on account of this the Government exercises an extensive control over both corporation and private forests. Of the German forests 33 per cent belong to the State 14 per cent to corporations, and 53 per cent to private persons; the corporation forests are under State control, as also with the State forests 2 per cent. This being more than one half of the area the control over private forests has of late years been considerably reduced and in some parts abolished altogether. It is worthy of notice that over 20 per cent of the Swedish and 12 per cent of the Norwegian forests belong to the State while the bulk are private forests over which little or no control is exercised by the State. Large quantities of timber are exported annually from these countries to Great Britain and other countries and it may safely be expected that these supplies will considerably decrease in the course of time.

DEFORESTATION IN RUSSIA

The following article appeared in a recent number of the *Literary Digest*. It was translated from *Preussiche Jahrbucher* for July.

When treating of the Russian famine of 1891-92 in the April number of this magazine we remarked that this was not to be regarded as a passing incident, but rather as the inauguration of a chronic condition of affairs traces of which

...ent to agriculture farming to the general wealth...drawn...of capital from the land for investment in manufacturing enterprises under the aegis of a protective tariff and to the general deforestation of the country in great part to provide fuel for manufacturing and protected enterprises. The fatal consequences of this general deforestation are now generally appreciated the shrunken state of the once noble rivers of the country and growing aridity of the climate affording evidence that can neither be overlooked or gainsaid.

The regime of the mighty rivers the Ikon Volga and the Dnepr the great arteries of Russia were formerly fringed with wide spreading forests along their whole upper and middle courses which sustained their volume and moisture from evaporation throughout the year. These forests have now for the most part disappeared. Year after year the traveller sees nothing but ugly sandy and gravelly slopes in broken succession the Middle Volga grows yearly shallower. The steamers that formerly drew eight feet of water in mid stream, and the ferries pushed their way across from bank to bank wherever the ever shifting channel...low...with which to...and the waters of the former creeks dreamed and...of to carry the...Volga, with a flow of some 22...now be forded in...

The city of Samara...on its banks and it was at its mouth that the Swedish Army...to Peter the Great. The stream which...a large region...a channel...navigable...and...may run for half...of the year...In future it must be...from the map of the living and...rivers...the upper course has been...and...and...with sand and earth. As it was, wide fertile...and...the...and...Samara...and...two...which...a great part of the country with the heat and...of the Asian steppes. The present condition of our black earth region...and...dangerous that it calls for immediate...for the...of the...and the...to which the further development of the situation is perhaps a question of life and death."

There is perfect unanimity in attributing the...to the deforestation of the forests. Innumerable factories...and...and the...of any systematic...were...they were...in the heart of the forest and after having...and...for which many leagues their...was...transferred to fresh...This...the system of...which was...by the...of railways built to maintain their connection with the great...of...and...generally by the transport of...For the past forty years the...of...factories have been...almost wholly with wood without a thought being given to any provision for reproduction. The existence of the railway...on...for...enormous...from the...forests. These were the manufacturers' views even on the fate of the Russian forests was sealed. The merchants have devoured the woods."

The recently passed law for the protection of the forests has come fifteen, twenty or twenty five years too late to avert the destruction of the agricultural region.

And the Government and people of Russia have really been warned. Fifty-two years ago that is about a year after the famine of 1867 to which the following is a letter from the Khersonese Government to the Imperial Society of Acclima-

mics "There are now living people who remember when the present limitless expanse of sand waste along the banks of the Dones was covered with almost impenetrable forest interspersed with akes, which have since dried up, or are fast drying up Our region is flat, deforested and exposed to all winds The fatal east wind finds no impediment, and brings ruin in its train This wind will perhaps at no distant date prove fatal The Grecian colonies went under probably from the same cause Protect the forest, so plant forests, protect them with rigorous laws The Volga and Don and all the rivers of southern Russia will be silted up and disappear unless the forests be protected"

More fatal even than the drying up of the streams is the cessation of the spring and summer rains This is the immediate cause of last year's harvest failure, and on it even depends the current year's harvest. There have been local rains, but not nearly enough

This reversal of old conditions has been coming on gradually with the denudation of the forests, and emphatic warnings as we have seen have been uttered. The only result has been the appointment of commissions which have done nothing Remedial measures on a large scale are now contemplated Are they too late?

A PLEA FOR PLANTING

The sixth Earl of Haddington, in a work in the form of letters to his grandson, published in 1773, says "When I came to live here (1770) there were not above fourteen acres set with trees I believe that it was a received motion that no trees would grow here on account of the sea air, and the north-east wind, so that the first of our family who had lived here either believed the common opinion, or did not delight in planting" He continues "I had no pleasure in planting but delighted in horses and dogs, and the sports of the field, but my wife did what she could to engage me to it, but in vain At last she asked leave to go about it herself which she did, and I was much pleased with some little things, which were well laid out and executed These attracted my notice and the Earl of Mar the Marquis of Tweedale and others admired the beauty of the work and the enterprise of the lady" After his lady had planted several ornamental clumps in the shape of wildernesses, she proposed to plant a field of about three hundred Scotch acres called the Muir of Tyninghame a waste common of very little value. From this all her ladyship's friends, as well as her lord tried to dissuade her but in vain she planted this likewise In 1707 she began Beningwood the prejudice of the country being still against her they continued to deride her telling her it could be of no use Success however always gave her encouragement The next was a large tract of ground mostly dead sand with very little grass, and very near the sea Here her ladyship particularized in the common prejudices and thought it would be of no use but as a gentleman from Hamburgh being there on a visit told her he had seen timber growing on such land, she immediately formed a resolution of putting it to a test planted sixty-seven acres of it and the trees grew to the astonishment of all who saw them Thus her ladyship to the honor of her sex and benefit of her lord and her country, overcame the prejudices of the sea and the barren moor being pernicious and of horses and dogs being the best amusement for a nobleman, converting a dashing son of Nimrod into an industrious planter a thoughtless spendthrift into a frugal patriot. His lordship goes on to say the next was a field which he had often let to tenants, who could do nothing with it, and further that he had a great deal

more waste land and intended to plant it all These woods were of all the usual sorts of timber, beech, chestnut, larch, etc But oaks were the favorite and succeeded extremely well in every sort of soil.

"Thus can good wives, when wise, in every station,
On man work miracles of reformation,
"And were such wives more common, their husbands would endure it,
"However great the malady, a loving wife can cure it
"And much their aid is wanted, we hope they'll use it fairish,
"While barren ground where wood should be, appears in every parish

Trees for Shelter

Fraser in his "Practical Forestry" very truthfully says that pioneers in heavily wooded regions are usually anxious to make a clearing and as every tree felled not only increases the area which he has to cultivate but extends his view the axe is often kept in use long after there is any necessity for the purpose of obtaining land for cultivation In a few years the settler who was at first so anxious to open up the country, finds he has gone a little too far in this direction, for his own comfort and that of his animals For on taking down the screen, he has not only admitted the cold winds of winter but those of summer sweep over his fields drying away needed moisture whip the fruit from his trees before it is ripe and otherwise cause loss that might have been prevented

It is then that he begins to feel the need of protection and to wish that his house and outbuildings were sheltered by the shade of some friendly forest or grove

The hygroscopic property of humus or vegetable earth is much greater than that of any mineral soil and consequently a forest ground where humus abounds absorbs the moisture of the atmosphere more rapidly and in larger proportion than common earth The condensation of vapour by absorption develops heat and consequently elevates the temperature of the soil which absorbs it together with that of air in contact with the surface Von Bahr found the temperature of sandy ground thus raised from 48 to 80 F that of soil rich in humus from 48 to 85 F

The question of the influence of the woods on temperature does not in the present state of our knowledge admit of precise solution and as many the primitive forests are disappearing so rapidly before the axe of the woodman that we shall never be able to estimate with accuracy the climatological action of the natural wood though all the physical functions of artificial plantations will doubtless, one day be approximately known

But the value of trees as a mechanical screen to the soil, they cover and often to ground far to the leeward of them is most abundantly established and this agency alone is important enough to justify extensive plantation in all countries which do not enjoy this indispensable protection.

FORESTRY BYE-PRODUCTS *

It has been said that there is in the British Isles an immense area of land that either never has yielded, or at the present time does not yield, any agricultural rent, but which might become of value were capital invested in planting it with timber trees.

Though, in common with other trades, the British production of timber has been rendered far less remunerative than formerly by keen foreign competition, it can be shown that timber will yet, in many cases, yield a very fair return for capital.

The forest produce of Great Britain is mainly applied in the following ways :—

1. Ship and boat-building piers, bridges etc., requiring much large and sound timber
2. Building, scaffolding, etc.
3. Railway sleepers.
4. Pit props.
5. Fencing.
6. Furniture, mainly chairs of beech, yew, etc
7. Hop poles and agricultural implements.
8. Bobbin wood.
9. Fagots and firewood.
10. Charcoal for gunpowder, pitch, etc
11. Bark for tanning.

In the first four of these branches the produce of the forests of Scandinavia, for the present apparently inexhaustible, shipped at the very smallest modicum of profit to the producers, has almost driven British timber out of the market. The rent charges on land, the costliness of labor and of overland transit in Great Britain, may be contributing causes to this result, but it is also apparently the fact that the sending of crooked or heavily-shaped timber into the market by British foresters is another reason for the success of Scandinavian trade. The best means of meeting foreign competition is by looking to increased economy of production, coupled with excellence of quality, and as in other trades, it is probable that the utilization of waste substances and bye-products may prove the chief key to economical production. Hop poles, agricultural implements and bobbin wood are locally among the most remunerative outlets for coppice produce, the main question with reference to them being economy of production and utilization of waste.

Though hops form a very uncertain and costly crop, the profits on hop-growing are so considerable that the extension of its culture should be considered by our farmers. Chemical substitutes for hops cannot be successfully used to the exclusion of the natural bitter, whilst the "bine" could be used in the manufacture of textile products, or of paper. The Spanish chestnut, ash, and larch are largely grown for hop poles in the south of England.

Ash is also in constant demand for the handles of ploughs, spades, axes, and other implements, and is, like sycamore, the wood of which is considerably used by wheelwrights, a rapidly growing tree.

* By G. S. Boulger, F.L.S., F.G.S., *London*, in Forestry and Forest Products Edinburgh 1894.

The cultivation of hornbeam for such purposes might also be extended more especially on poor gravelly land

There are undoubtedly many trades not thought of by the timber merchants in which considerable quantities of small woods are consumed Thus it is alleged by United States statisticians that besides 300000 new telegraph poles and 3000000 cords of wood used in brick burning the making of shoe pegs alone uses 100000 cords of soft maple annually that of lucifer matches 300000 cubic feet of pine, and that of boot nuts and tool handles 1000000 cords of birch

Such facts suggest the possibility of a remunerative production of larger quantities of coppice woods.

It being man's highest intellectual function to utilize to the full all the latent powers of nature we may well direct our attention to such bye products as bark, charcoal, wood spirit, turpentine tar saw dust leaf manure and wood ashes

Bark.

Bark is used for tanning viz for the conversion of hides or skins into a strong supple impenetrable and durable material known as *leather* by the union of albumen gelatine or collagen of their connective tissue with a substance in the bark known as *tannin* so as to form insoluble tannates. Tannin is widely distributed throughout the vegetable kingdom especially in barks fruits and galls It is characterised by a slightly acid reaction and astringent taste a bluish or greenish black coloration (ink) with ferric salts the precipitation of gelatine and albumen from their solution and its union with them as alkaloids do Sumach leaves form a valuable material for white morocco leathers divi divi the seed pods of *Cæsalpinia* Hemlock extract a decoction of the bark of the hemlock spruce (*Abies canadensis*) and numerous barks from the Australian wattles (*Acacia*) are largely used but the chief British tanning material is oak bark In France the young bark of the cork oak (*Quercus suber*) is largely used and for fine leather that of the evergreen oak (*Q ilex*) in the eastern United States the white oak (*Q alba*) the quercitron (*Q tinctoria*) and the red oak bark are employed while California and the western territories depend on the chestnut oak for tanning purposes.

When coppice was largely grown for bark a rotation of twenty four years was common the stools being eight feet apart the trees are more productive in proportion at twelve than at double that number years growth Branches down to an inch in diameter should be carefully peeled since their bark contains a higher proportion of tannin than that of the trunk.

Since the low prices for bark have made many foresters doubt the expediency of felling their oak in May when the tannin is nearest at its worst it may be well to bear in mind that French and Prussian experiments have shown that bark of good quality may be obtained at any season by steaming the wood for from one and a half to two and a half hours according to the season after which the bark peels easily

Willow bark is largely and successfully used in Russia for the best leather and the bark of young alder shoots not a third of an inch in diameter yields sixteen per cent. of tannin The bark of pine and larch is only used for roughly tanning sheepskins

There is a possibility of chrome tanning superseding the use of bark of any kind.

Charcoal.

The value of charred wood fibre deprived of its liquid and volatile portion by destructive distillation, for smelting and heating purposes has long been recognized. Though now in England, Belgium and other coal producing countries cheapness of production outweighs considerations of quality, the value of Swedish iron is probably with justice attributed to its being smelted with charcoal, and many of the furnaces of the United States are as dependent upon the wood supply, as were those of Sussex in the sixteenth and seventeenth centuries. For charcoal making the hard woods are mainly used, beech charcoal being preferred in the mineralogical laboratory.

In Great Britain the chief use of charcoal is in the manufacture of gunpowder, for which purpose a highly inflammable quality which is obtained from light spongy woods of various broad leaved species is generally required. It requires to be as free from earthy or mineral matter as possible, though no charcoal is absolutely pure carbon, generally retaining as it does some hydrogen and oxygen, as well as mineral ash. For this reason though still largely prepared by the primitive method of pits or heaps covered with turf, charcoal is preferably manufactured in iron cylinders or retorts, a method which is far more economical and yields a more uniform result. The inflammable gases distilled from the wood are conveyed by pipes into the furnaces below the retorts, so that an immense saving in fuel is effected while the tar, pyroligneous acid, etc. are condensed and collected. The temperature at which the wood is charred exercises a great effect upon the properties of the charcoal. The higher the temperature the more completely are the hydrogen and oxygen of the wood driven off, and the denser and harder is the resulting charcoal, while its temperature of ignition is also higher in proportion. Slack burnt charcoal retains more volatile matter is softer, reddish, more readily inflammable and more hygroscopic.

It has been found by experiment that, with sixty grains of saltpetre, twelve grains of each of the following kinds of charcoal give the number of cubic inches of gas (CO_2) in the table:—

Dogwood (*Rhamnus frangula*)	82	cubic inches.
Willow (*Salix alba*)	77	
Alder	74	" "
Filbert	72	" "
Fir, chestnut, hazel	66	" "

The three first named species are accordingly preferred for the purpose, though *Cornus sanguinea*, *Euonymus europæus*, *Rhamnus catharticus* and perhaps other species are not uncommonly substituted for the alder buckhorn, berry bearing alder or true "dogwood" of gunpowder manufacturers. *Rhamnus frangula*, this is a slow growing shrub, being cut when about an inch in diameter and under ten years of age, in lengths of not more than six feet. It is grown in Prussia, Belgium, and Sussex. It forms a very explosive powder, used for military small arms, and for sporting purposes. Willow and alder are of quicker growth, especially the former and are cut when about four inches in diameter. With reference to the use of the two last named species an important fact is that they can be cut in the spring when their bark is in the best condition for tanning purposes. Charcoal is also of great value as a filtering and deodorising agent.

Volatile Products

Besides a certain amount of tar and the inflammable gases which as has been stated are utilized as fuel in the charcoal manufacture even the smoke has proved of considerable value. It contains methylic alcohol, which also distils over from the retort in a liquid form, accompanied by acetic acid. This crude distillate is known as "wood vinegar," and is redistilled and rectified over quicklime yielding "wood spirit" (crude methylic alcohol). The acid portion is then saturated with slaked lime so as to form a solution of calcium acetate which is evaporated, the salt being used in the manufacture of acetic acid and metallic acetates, especially that of lead as a step towards the formation of white lead.

Dr Hough describes a charcoal iron smelting factory in Michigan where a cord of wood yields forty-two bushels of charcoal worth 7 cents per bushel, or $2·9 cents per cord, besides 2,500 cubic feet of smoke valued at over 30 cents, and the inflammable gas which supplies three-fourths of the fuel consumed. The smoke yields two gallons of wood spirit, worth 85 cents (3s. 4½d.) per gallon in the Chicago market, and 200 lb. of acetate of lime worth 2½ cents (1½d.) per lb. in Philadelphia. Thus the smoke for which 30 cents (1s. 3d.) are paid yields $6·70 (£1 6s. 9d.), the total yield of a cord of wood being $9·69 (£1 18s. 8d.). These products are best obtained from dry hard woods, especially beech.

Tar and Pitch

The mixture of heavy non-volatile hydrocarbons known as tar, though obtained in small proportions in the destructive distillation of all kinds of wood, is yielded mainly by the roots, knots, branches, and waste timber of pines, especially *Pinus palustris* and *P. rigida*, and *P. pinaster*. It is mainly imported from the southern United States, from Archangel, and from Riga and other Baltic ports.

The pitch pine (*P. palustris*) covers extensive tracts, and springs up spontaneously in the disused cotton fields of the Southern States, while the Scots pine (*P. sylvestris*) forms enormous forests in the North of Europe and in Siberia. The preparation of tar is still virtually the same as that described by Theophrastus. A hole is dug in the side of the bank in which billets of wood are heaped up and covered closely with turf or earth, a fire is then kindled from below and the slow combustion causes the tar to exude from the wood and flow out from the heap into barrels placed below to receive it. On distillation, tar yields wood vinegar, creosote, and oil of tar, leaving a residue of pitch. The black, brittle, glassy solid which we know as pitch and which is usually home manufactured is usually obtained by simply boiling the tar so as to drive off the volatile oils.

Turpentine, Resin, etc.

In addition to being our chief sources of tar and pitch, the firs are the exclusive commercial source of the oleo-resin known as turpentine. This is a solution of a resin in a volatile oil which exudes from incisions made in the stems of these trees. On distillation it yields from 14 to 16 per cent. of colourless essential oil known as oil or spirits of turpentine ($C_{10}H_{16}$), the residue being resin or colophony (the formula of which is probably $C_{44}H_{62}O_{04}$). The greatest quantity of turpentine imported is the produce of the pitch pines (*Pinus*

pumilio or *P. mugho* the swamp pine and *P. serotina* the frankincense pine of Virginia Carolina and other Southern States but a considerable quantity imported from Russia and Sweden is the product of the Scots pine *P. sylvestris* and from the south of France under the name of Bordeaux turpentine where it is obtained from the cluster pine *P. pinaster* and other species. Strasburg turpentine is obtained from the silver fir (*Abies pectinata*) and Venice turpentine from the larch (*Larix europæa*). Canada balsam is a similar product from *Abies canadensis* and *A. balsamea*. The extraction of the cluster pine *P. pinaster* on the sandy dunes of the Landes of Bordeaux is a good example of the conversion of an originally merely protective measure into a source of profit from what formerly were but wastes. When the planting of the forests of Southern France by enclosing fields and hedgerows was carried out originally the cause of the evil harmattan winds was certain it is that by breaking up the natural drainage and allowing marshy places to become swamps and wastes the advance of which was only stopped by the planting roots of these pines. Originally planted with the protective object of turning bark turpentine and tar has remained from a source of profit which enables us to say that we have in our own country considerable stretches of waste. A considerable quantity containing from 50 to 75 per cent of carbon has been obtained by M. Guillemara from the resin from the Bordeaux area.

Minor Products.

Besides such substances as bark charcoal wood spirit acetic acid tar pitch turpentine and resin which are important articles of commerce experience however has demonstrated in the past and may be expected to show more frequently in the future the presence of substances in trees which might well form sources of profit. For example from the sap of the Scots pine and of the larch forest workers bark at certain seasons a sugar which is often obtained with various variations of essential oil and resin. Such an expensive substance to prepare that is quite out of the question as a source of wealth is the inner part of the bark of two species of orchid.

Another similar product not as yet much investigated is that obtained by extraction from the bark of the common birch a black gummy extract which resists the action of air and water and also will consequently increase the durability of paper or gutta percha even to this we will refer as a similar product. As in the case of sassafras it has been found that the forestry waste of these products the oil of birch and wintergreen bark if not more important as in Maryland the smoke has proved more valuable than the charcoal as the development of new chemical industries may render such products as the volatile oil and gutta percha more remunerative than the timber itself.

Leaves, Sawdust, Etc.

In Styria young pine and fir needles from cuttings or thinnings made in spring are dried in ovens or kilns ground mixed with one twenty-fifth of salt and used with advantage as a food for cattle. Similarly in the north of Italy the dried leaves of the poplar have long been used as cattle food and chemical analyses bear out their value for this purpose. When not used for fodder however dried leaves make an excellent litter and analysis proves their value as manure.

The following table, prepared in Bavaria, exhibits the composition of the leaves produced annually by an acre of forest under beech, pine, or spruce, as compared with that of a ton of wheat straw:—

	Dry matter	Ash	Potash	Lime	Magnesia	Phosphoric acid	Sulphuric acid
	lb.	lb.	lb.	lb.	lb.	lb.	lb.
Beech, per acre of land	2,972	165.5	1.80	17 18	10 90	2.32	3.28
Pine, per acre of land	2,842	41 5	4.32	16.84	4.28	3.28	1 51
Spruce, per acre of land	2,683	121.3	4.90	57.87	6.20	5.72	1 87
Wheat straw per ton	2,240	85.2	2.80	5.20	2.20	4.60	2.41

Saw dust also forms a good litter for cows and horses, and though destitute itself of manurial value, being very absorbent of liquid manure, can when thus soaked, be used as a valuable top dressing

Finally, if the forester has any waste that he cannot utilize in the tan pit or the charcoal retort, as paper pulp, or as firewood, it is probably best to burn it so as to avoid harboring insects and fungus life By so doing he will lose Little of the manurial value of the refuse, and leached ashes, being rich in potash, is a valuable dressing for old grass land, orchards, market gardens, onions, rye, and other crops. The potash might even be recovered by lixiviation of the ashes and used for many purposes.

The Production of Wood Pulp*

The wood-pulp industry may be said to have commenced in the year 1846 But its development during the first thirty years was decidedly slow Since 1876, however, the production of this material has increased rapidly Its pre-industrial period was known only to the chemist. Cellulose was made in the laboratory in 1840 but it was not manufactured commercially till 1852. Ground wood was first used for paper-making about the year 1846, when it was manufactured by Keller under a patent taken out in Saxony in the previous year Since that date many improvements have been made in the machinery and methods used in grinding, the main object being to produce a longer and finer fibre. The fibres of the wood are torn away by mechanical pressure against a revolving grindstone in contact with water No chemical treatment of the wood is necessary, the only requirements of this industry being cheap wood, abundant water-power and suitable machinery

Processes, such as Sinclair's, have long been in use for pulping very finely cut coniferous wood, and in the Paris Exhibition of 1880 one of the most prominent objects exhibited in the Norwegian Section was a *pate de bois* or *papier maché*, made in this way from pine wood, and worked into cardboard and various moulded panellings, etc. It has been found, moreover that in this way the whole of a pine tree trunk —branches, needles, and all —can be converted into paper without waste. Saplings, which it would not pay to cut for firewood, are now profitably worked up in this way into pasteboard

* By G. F Green, C. F. Cross and E. J Bevan, in Forestry and Forest Products Edinburgh, 1884.

By the chemical processes for manufacturing wood pulp a good class of pulp is made from the quick growing poplar and from spruce. The wood of the slower growing timber basswood makes an equally valuable white paper pulp.

Oak can also be used, though yielding an inferior product that requires bleaching. One great advantage in the method is that the tannin in the oak is obtained as a by-product, and the chemicals which in the lye being rather an aid than a hindrance to the tanning process, it is found that hides can be perfectly tanned in a ten days. This seems to offer to the cultivator of oak coppice or the enterprising planter of poplars a most important source of income, whilst in coniferous plantations there need be absolutely no waste.

The chemical preparation of fibre has given rise to two distinct processes—the soda process and the acid process.

Chemical pulp (celluloses) is used as an admixture with esparto rags or mechanical pulp in the manufacture of news, printings, covers, and some kinds of wrapping paper. It forms, according to Mr. Routledge, an excellent *soutenue*, takes sizing and bleaches to a high color. Fine prints are also manufactured exclusively from acid pulp.

Mechanical pulp is chiefly used as an adjunct in the manufacture of news, cheap printings, and wall papers, but there are several distinct classes of paper made from it without any other ingredient, viz. wood pulp millboards from white pine pulp and various soft colored wrappings and tinted wall papers from brown, sometimes styled patent pulp.

Another important use is for wood pulp boards and so-called "patent" or brown boards, the latter being produced from brown pine pulp and the former from white pine-pulp.

The consumption of wood pulp boards is increasing rapidly, chiefly for making paper boxes, for which they possess certain advantages over straw boards.

Although almost any wood can be converted into pulp, experience has hitherto decided in favor of conifers of a certain age.

For chemical pulp trees on an average of twenty years growth and a thickness of six to eight inches at the base of the stem are said to be the best. Younger wood is more tractable by chemical means but produces a fibre of inferior quality. Older wood requires stronger chemicals to remove the incrusting matter and possesses no compensating advantages.

In Canada many species of wood have been utilized amongst which may be mentioned pine, poplar, spruce, willow, basswood, cedar, hemlock, maple, and birch.

Poplar pulp remains white, birch becomes pink, maple turns of a purple tint, and basswood reddish after grinding.

The practical operations concerned in the manufacture of pulp from wood by the caustic soda process may be divided into the following: Barking, sawing, chopping, crushing, boiling or digesting, washing and bleaching treatment for sale as half-stuff, and soda recovery.

Hemlock Extract

In the final Report of the Select Committee of the House of Commons (Canada) in 1868 on the best means of protecting Hemlock Timber from destruction the conclusion was come to, after a most careful consideration of the question, that unless some steps were speedily taken to check the wasteful and extravagant rate of consumption then going on, ready for the benefit of other countries at the

expense of Canada many years would not elapse before our own tanneries would be seriously crippled and we no longer able to compete successfully with other countries in the manufacture of leather

Answers from Galt Guelph etc.—Hemlock getting scarce not more than ten years supply timber, sawn into lumber used for rough work such as roofing, etc.

Large quantities in Drummond and Arthabaska five bark factories in the counties timber used for scantling and rough boarding in settled districts timber worth four to eight dollars per M in remote districts not of settlement value bear transportation about one cord of bark is procured from 1 000 feet of lumber, bark in some districts used for domestic purposes only in others as Eastern Townships manufactured into extract five factories produced twenty thousand barrels of 400 pounds each worth 2½ cents per lb at the factory and 5 cents per lb in Boston 1½ to 3 cords of bark will produce 1 bbl of extract, worth in Boston $20 a barrel.

On non resident lands the timber is allowed to rot on the ground and squatters, as a rule, either burn or allow it to rot if not close to a market

In some districts the best is sawn into lumber or cut into lathwood for exportation to England, the balance for railroad ties or cordwood

Wherever a farmer makes bark on his own land he cuts the peeled trees into sawlogs and clears the land Where trespassers peel bark they leave the trees to rot.

After the destruction of a hemlock forest it is generally succeeded by a mixed growth of maple poplar, cherry and balsam when not cleared for farming purposes even if replanted it would take one hundred years growth to render it available for tanning or extract purposes

About 500 lbs or more of green raw hide can be converted into leather by one cord of bark Hemlock extract is said to convert raw hide and leather in one-sixth of the time, and at one-half of the cost.

The effect of the manufacture and export of hemlock extract will exhaust the hemlock forests at all accessible points and compel manufacturers to remove their tanneries into the rural districts to obtain a supply of bark raise the price of bark and consequently of leather, and diminish the quantity of leather produced.

For the protection of our hemlock forests it was suggested that the extract should be manufactured under a license upon Government land an export duty charged on bark, and a considerable excise duty on extract manufactured for exportation.

An acre of good hemlock land would produce from ten to twelve cords of bark worth from $40 to $50 delivered at the factory, at a cost say of $1 per cord for felling and $1 per cord for carting

The cord of hemlock lathwood 128 cubic feet, is worth $8 at Montreal or Quebec

The conclusion arrived at from this evidence was that our hemlock forests are being and have been rapidly depleted and destroyed and that without proper care and forethought the language put into the mouth of the Indian many years ago (referring to stripping the soil of its trees) may in a degree become true—

> "The realms our tribes are crushed to get,
> May be a barren desert yet."

And the remedy seems to be that active measures be resorted to for select cutting natural reforestation and planting and systematic forestry management.

THE GEOGRAPHICAL DISTRIBUTION OF THE FOREST TREES OF CANADA.

In the report of the Geological Survey of Canada for [illegible] there is a paper by Dr. [illegible] [illegible] tains are represented. Dr Bell says :—

The [illegible] of North America [illegible]

[illegible]

[illegible]

there retard (which they accelerate) gradually round in a more or less concentric fashion and other trees occupy the intervening ground. These are marked features of forest distribution and show that the present limits of prairie and wood are of very ancient date. The existence of the smaller plants and also of certain superficial geological conditions all point to the same conclusion.

The State of Minnesota is situated in a very interesting region in regard to forest distribution. Here we find the northern limit of the group to which the most southern trees of Ontario belong, such as the black walnut, shagbark hickory, hackberry and Kentucky coffee tree, the most western limit of the common trees of the northern states and of quaking and bitter aspen, white oak, red cedar, etc., several species, not found here, become white ash, rock elm, red oak, yellow ash, black ash, sugar maple, red maple, etc. The western boundaries of some of the trees whose northern limits pass through Southern Ontario, such as the white cedar, canoe and white birch, and red pine, the northern limits of the most northern group, including the white spruce, the large-toothed poplar, balsam poplar and canoe birch, and the general eastern limits of some of the western species such as the red-twigged maple, green ash, burr oak, and cottonwood.

It will be observed that in Labrador peninsula the trees tend northward midway between the eastern and western shores. This is the party to the unfavorable influence of the warm water and partly to the beneficial effect of the central depression in which the rivers run northward into Hudson Bay.

From Montreal to Lake Superior the height of land north of the St Lawrence is in large part parallel to the general course of the river, marking the northern boundary of the trees. And it may have had some effect in limiting the northward range of a number of species. A northward curve in the watershed about the latitude of Ottawa is marked by a corresponding curve in the tree lines. Again where a great inland area is free from high plateaus some of the trees which on each coast may be approaching their northern limits are found to extend in the river valleys and their general direction is rather east. An example of this the Lake Temiskaming and Abitibi district and the valley of the Kenogami or probably most feature of the Albany may be mentioned.

On the Mississagi or west branch of the Moose River the white pine reappears but in general boundary is bounded by a subarctic flora. The Saguenay for a short distance from the St Lawrence is really a part or arm of the sea and the country in the vicinity of Lake St John at the head of the river is largely covered with spruce and has a flora which although surrounded by a mountainous region. Here we find an isolated colony of mountain sugar maple and other trees completely removed from the rest of their species. On the north side of Lake Huron and to the north of the City of Quebec the arctic flora appears at various points and in both instances the trees near these localities are more closely crowded together than elsewhere.

Some kinds of trees in approaching their northern limits show a tendency to diminish gradually in size as if to have more and more scattered rendering it difficult to draw any definite boundary of the species whose outlying values are stunted. The latter habit is more characteristic of southern than of others species so far as the form now is concerned. The various species appear to die out more gradually as they range northward in the western than in the eastern regions.

Forest trees east of the Rocky Mountains may be divided into four groups, as regards their geographical distribution within the Dominion.

1. A northern group, including the white and black spruces, larch, Banksian pine, balsam fir, aspen, balsam poplar, canoe birch, willows and alder. These cover the vast territory down to about the line of the white pine.

2. A central group of about forty species occupying a belt of country from the white pine line to that of the buttonwood.

3. A southern group, embracing the buttonwood, black walnut, the hickories, chestnut, tulip tree, prickly ash, sour-gum, sassafras, and flowering dogwood, which are found only in a small area in the southern part of Ontario.

4. A western group, consisting of the ash-leaved maple, burr oak, cottonwood, and green ash, which are scattered sparingly over the prairie and wooded regions west of Red River, and Lake Winnipeg.

In the western peninsula of Ontario the forests present a remarkable richness in the number of species to be found growing together. In some localities as many as fifty different kinds may be counted on a single farm lot. A more varied mixture is probably not to be met with in any other part of the continent, or perhaps in the world.

LEVELS OF THE OTTAWA.

The following tables from the reports of the Geological Survey (Canada show the levels at various points on the St. Lawrence, Ottawa and Mattawa rivers, from Three Rivers to Lake Nipissing

Levels of the Ottawa above the waters of the St Lawrence at Three Rivers, which is about the highest point affected by the action of the tides --

	Distance, miles.	Rise. ft. & in.	Total rise ft. & in.	
Rise from Three Rivers to Montreal harbour as stated in a report of the Hon. H. H. Killaly, President of the Board of Works in 1845	90	12 9	12 9	Montreal.
Rise from Montreal harbour to lake St. Louis at Lachine, from the same report				
1 lock		13 3		
2 "		13 3		
3 "		8 6		
4 "		9 0		
5 "	0.9			
	10	44 9	57 6	Lachine.
Rise in lake St. Louis from Lachine to Ste. Anne	13	0 6	58 0	
Rise in the lock at Ste. Anne		3 0	61 0	
Rise in the lake of Two Mountains from Ste. Anne to Carillon	33	0 8	61 8	Carillon.
Rise from Carillon to Blondeau				
1 lock, up	10.0			
2 "	11 0			
	21			
3 lock down	13	4½	69 8	
Rise in Chute à Blondeau		4 0	73 8	
Rise in the Grenville canal from the head of Blondeau to the head of Grenville canal.				
1 lock	3 0			
2 "	3			
3 "	8			
4 "	8			
5 "	7			
6 "	6	6½	85 0	108 0 Grenville.
Rise in the navigable part of the Ottawa, between Grenville and the entrance to the Rideau canal.	58½	9 4	118.0	Ottawa.
Rise from the entrance of the Rideau canal to the Chaudière lake, viz:—Rise in the Rideau canal to Dow's Swamp				
1 lock	11.0			
2 "	10			
3 "	10			
4 "	10			
5 "	10			
6 "	10			
7 "	10			
8	10			
	81			
Fall from Dow's Swamp to Chaudière lake	13	6	93 0	131 0 Chaudière.
Rise in Chaudière lake from the foot to Fitzroy harbour at the head, supposed to be one inch per mile.	25	2 1	133 1	
Rise from Fitzroy harbour to Chats lake, as ascertained by levels taken up the Mississippi channel by the Board of Works in 1845, 49 95, say	3	50 0	233 1	Chats.
Rise in Chats lake from the head of the Rapides des Chats to the foot of the Chenaux, supposed to be one inch per mile	15	1 3	234 4	

Levels of the Ottawa above the waters of the St. Lawrence at Three Rivers.—*Continued.*

	Distance. miles.	Rise. ft. & in.	Total rise. ft. & in.	
Rise from the foot of the Chenaux to Portage du Fort, a strong current prevailing all the way, supposed to be 12 inches per mile.	5	5 0	239 4	Portage du Fort.
Rise in the rapid at Portage du Fort ..		17 0	256 4	
Rise between the head of Portage du Fort rapid and the foot of the Sable, a strong current prevailing all the way, say one foot per mile	5	5 0	261 4	
Rise in the Sable rapid and two small ripples above.	0½	6 2	267 6	Sable.
Rise between the Sable and the Mountain Chute	1½	1 0	268 6	
Rise from the boom at the foot to dead water at the head of the Mountain Chute, according to Mr. Gerrard Nagle		15 0	283 6	Mountain.
Rise from the head of the Mountain Chute to the foot of D'Argis rapid, say 8 inches per mile ...	1	0 8	284 2	
Rise in the D'Argis rapid		5 0	289 2	D'Argis.
Rise from the head of D'Argis to the foot of the Calumet Falls, say 8 inches per mile.	1½	0 10	290 0	
Rise in the Calumet Falls, according to Mr Gerrard Nagle:—from dead water at the foot of the falls to the foot of the middle slide 26 8				
From the foot of the middle slide to dead water at the head 39 7	1	65 10	355 10	Calumet
Rise from the head of the Calumet Falls to the head of the Calumet island, a considerable current prevailing the whole distance, say 6 inches per mile	13	6 6	362 4	
Rise from the head of the Calumet island to Fort Coulonges, including about 1 foot at La Passe rapid...	5	2 8	365 0	Fort Coulonges.
Rise in Fort Coulonges lake from Fort Coulonges to the mouth of the Black river, quiet water all the way, say 2 inches per mile	8	1 4	366 4	Black river
Rise from the mouth of the Black river to the Chapeau rapid, swift water, say 6 inches to the mile	6	3 0	369 4	
Rise in the Chapeau rapid		2 0	371 4	Chapeau.
Rise from the Chapeau to the Culbute, swift water all the way, say 6 inches per mile	5	2 6	373 10	
Rise in the Chute Culbute from the foot of the current to dead water at the head, according to the Board of Works		19 7	393 5	Culbute and lake Allumettes.
Rise from the head of Culbute rapid by Upper Allumettes lake and the Deep river to the foot of the Joachim Falls. The current in the deep river is so moderate that with a very gentle wind rafts are sometimes carried up stream without sails. The rise is supposed to be 2 inches per mile	32	5 4	398 9	Joachim.
Rise in the Joachim Falls from the Deep river to dead water at the head, according to Mr Gerrard Nagle	1	23 3	422 0	
Rise from the head of the Joachim Falls to the mouth of Bennett's brook, say 3 inches per mile	4	1 0	423 0	Bennett's brook.
Rise from Bennett's brook to the mouth of the Riviere du Moine, a strong current prevailing most of the way say 6 inches per mile	3½	1 9	424 9	Moine river
Rise from the Riviere du Moine to the foot of Islet rapid, a strong current prevailing at Riley's clearing and at McSwirley's clearing, say 5 inches per mile	6	3 4	428 1	
Rise from the foot of Islet rapid to the Roche Capitaine rapids, or that part of them called the Maribou, allowing one foot for the Islet	1	1 5	429 6	Islet
Rise from the head of Roche Capitaine	2	42 10	472 4	Roche Capitaine.
Rise from the head of Roche Capitaine to the foot of the Deux Rivieres, quiet water nearly the whole way, say 3 inches per mile	11	2 9	475 1	

Levels of the Ottawa above the waters of the St. Lawrence at Three Rivers. *Continued.*

	Distance, miles.	Rise, ft. & in.	Total rise, ft. & in.	
Rise from the foot of the Deux Rivieres rapid to the head of the Levier rapid, viz:— Difference of level between smooth water at the foot and smooth water at the head of the Deux Riviere Portage 13 33 Difference of level between the heads of the Deux Rivieres Portage and the mouth of the Maganasipi 8 55 Difference of level between the mouth of the Maganasipi and the head of the Levier rapid 8 09	3	30 4	505 5	Levier
Rise from the head of the Levier to the foot of the Mattawa rapids, being swift water nearly the whole distance, supposed to be 6 inches per mile	18	9 0	514 5	
Rise from the foot of the Mattawa rapids to the mouth of the Mattawa river ...	1½	5 0	519 5	Mattawa.
Rise from the mouth of the Mattawa to the foot of the Cave rapid, a considerable current about mid-way up, say 4 inches per mile	2½	0 10	520 3	Cave.
Rise from the foot of the Cave to the head of the Chaudron rapid viz:— Rise in the cave 5 75 Rise in the Chaudron 6 00	⅜	11 9	532 0	Chaudron
Rise from the head of the Chaudron to the foot of the Erables rapid, say 3½ inches per mile	3½	1 0	533 0	
Rise from the foot to the head of the Erables rapid.	¼	13 0	546 0	Erables.
Rise from the head of the Erables to the foot of the Mountain rapid, say 3½ inches per mile	3½	1 0	547 0	
Rise from the foot to the head of the Mountain rapid	¼	5 5	552 5	Mountain.
Rise in the Seven League lake from the head of the Mountain rapid to the foot of the Long Sault rapids, say 2½ inches per mile	17	3 6	555 11	
Rise from the foot to the head of the Long Sault rapids — 1st or lower leap. 6 92 Intermediate 1⅓ mile 2 50 2nd leap 0 16 Intermediate 1 2·13 mile 2 20 3rd Crooked rapid 6 38 Intermediate 1 2·13 mile 0 23 4th leap. 15 82 5th Upper rapid 8 34	6	48 5	604 4	Long Sault.
Rise from the head of Long Sault rapids to the mouth of the Opimika river above the Galere current, there is a perceptible current only in two places, say 3 inches per mile	12	3 0	607 4	Galere.
Rise from the mouth of the Opimika river to the head of lake Temiscaming, say 1 inch per mile.	55	4 8	612 0	Temiscaming
Miles	492½			

Levels of the Mattawa from its junction with the Ottawa, 519 feet 5 inches above the surface of the St. Lawrence at Three Rivers, to Trout or Turtle Lake.

	Miles.	Feet and inches.	Total	
Height above Three Rivers			519 5	
Rise from the mouth of the Mattawa to the foot of Plain-Chant rapids, including a rise of 1 foot 8 inches in 2 small rapids, allowing 4 inches per mile	2½	2 6	521 11	
Rise from foot to head of Plain-Chant rapids				
1 rise		15 98		
2 "		1 60		
	½	17 7	539 6	Plain Chant.
Rise in Long lake from the head of Plain Chant rapids to the foot of Portage a la Rose, say 3 inches per mile	5½	1 4	540 10	
Rise from the foot of Portage a la Rose to the head of Portage du Rocher above Amable du Fond river				
1 Portage a la Rose rise		5.90		
Intermediate		20		
2 Portage de la Compagnie		5.80		
Intermediate		0 80		
3 Portage du Rocher		5.05		
	2	17 9	668 7	Du Rocher.
Rise from the head of Portage du Rocher to the foot of Portage des Parresseux, say 8 inches per mile in addition to a small fall of 4 inches	3½	1 2	559 9	
Rise from the foot of Portage des Parresseux to the foot of the Talon or Hang falls				
1 Portage des Parresseux rise		33.9		
Intermediate		0 25		
2 Portage de la Prairie rise		8.55		
Intermediate		0 95		
3 Portage rise		6 30		
Intermediate		0 10		
4 No Portage rise		3 81		
Intermediate		0 33		
	2⅝	53 9	613 6	Foot of Talon.
Rise from the foot of Talon or Hang falls to the foot of Talon lake				
1 Portage de Talon rise		42 23		
Intermediate		0 25		
2 No Portage rise		0 85		
	⅝	43 4	656 10	
Rise from the foot to the head of lake Talon by the old canoe route, say 1 inch per mile	7	0 7	657 5	Lake Talon.
Rise from the head of Lake Talon to the foot of Lower Trout lake, the difference of level ascertained by the new canoe route, the distance by the old route, viz				
Rise from lake Talon to Lac des Pins		42 19		
Fall from Lac des Pins to Lower Trout lake		10 39		
	4½	31 8	688 8	Lower Trout lake.
Rise from Lower to Upper Trout lake, say 1 inch per mile in addition to a rise of 1 1 at the outlet of the Upper lake	3½	1 4	690 0	
Rise from foot to head of Upper Trout lake	⅛	0 0	690 0	Upper Trout lake.
	30⅜			
Levels from the surface of Upper Trout lake, 690 feet above the waters of the St. Lawrence at Three Rivers, to the surface of lake Nipissing				
Height of Upper Trout lake			690 0	
Rise from Trout lake to the height of land between it and the Vase river on the canoe Portage	½	24 5	714 5	Height of land.
Fall from the height of land to the Riviere a la Vase, at the end of the Portage	¾	22 11	691 6	Vase.
Fall from Trout lake Portage, on the Vase, to lake Nipissing				
Fall at 1st Portage		3 14		
Intermediate		1 00		
Fall at 2nd Portage		20 88		
Intermediate		1.50		
	4½	26 6	665 0	Nipissing.

Levels from the surface of Lake Nipissing, 665 feet above the waters of the St. Lawrence at Three Rivers, to that of Lake Huron, at the mouth of the French River

	Miles.	Feet.	Total rise.
Height of lake Nipissing agreeably to the estimate of Mr Wm. Hawkins in his report to the Commissioners of the lake Huron and Ottawa Survey in 1833, the falls on the French river are :—			665 0
1 Chaudiere falls (upper) 10 0			
2 Chaudiere " (lower) 15 0			
3 Rapids 3 0			
4 " 3 6			
5 " 3 0			
6 " 8 0			
7 " 2 0			
8 " 3 0			
9 " 6 0			
10 " 3 0		66 6	
Allowance for the supposed general slope of intermediate parts of the river, say 6 inches per mile	55	27 6	84 0
To the level of lake Huron			581 0
The ascertained height of the surface of lake Huron above the sea, according to the Michigan Surveyors is			573 0
Making a difference of			8 0

FOREST PROTECTION AND TREE CULTURE ON WATER FRONTAGES WITH THE VIEW OF PROVIDING A CONSTANT AND STEADY SUPPLY OF WATER FOOD SHADE AND SHELTER FOR FRESH-WATER FISH

At the conference of the International Fisheries Exhibition London in [illegible] June 1883 a paper on the above subject was read by [illegible] Esq Forest Conservator and Crown Surveyor for Denmark It was in substance as follows:—

Professional foresters take a great interest in the question as to how much importance to the success of pisciculture and to a free water supply also what may be the extent of any great evil resulting from the destruction of forests may become a question of interest to all at a time when not the former generation but the question of the protection proper management and extension of forest and forest trees in countries where are found the sources of rivers and supply of water to lakes and other fresh waters The greatest part of the forest area in Canada will without doubt for a long time to come remain the property of the State but there are no laws nor steps being taken for the preservation and proper management of these forests

That the forests regulate the flow of the water in water courses and ensure a steady supply during dry seasons when they prevent much evaporation Russia is a fact from [illegible] and proved that it does not admit of dispute I have [illegible] a great deal of uncertainty as to the extent of the action of a forest in the regulation and it is very probable that [illegible] opening of the new species of trees [illegible] that [illegible] may [illegible] Now there are many [illegible] forest in preserving the water that falls or that the [illegible] forest is necessary in order that the water may [illegible] I will [illegible] the evaporation of the forest was [illegible] the evaporation [illegible] result of this is that the water runs off [illegible] in places No [illegible] grant in a forest than that [illegible] plants No [illegible] except the [illegible] the [illegible] most [illegible] action is felt far above the actual height of the trees A [illegible] the [illegible] the [illegible] of storms and [illegible] want of forest protection has [illegible] and [illegible] and [illegible] and [illegible] remaining fish

But [illegible] as the winter rains cause the river in fact [illegible] became a raging [illegible] and property and [illegible] the forests on the slopes [illegible] destroyed [illegible] protecting them As a [illegible] and [illegible] property also as a question of prosperity forest protection has the greatest

claim to the attention of the Legislature. The forest, with its numberless roots and decaying vegetation retains the rain water and prevents it from rushing to the rivers and the sea, while it gives it off to these slowly and steadily. It acts like a great sieve and retains the fine particles of the soil which the influence of the air and sun, the frost and rain, and the action of the numberless roots have decomposed, thereby fertilizing the land and forming a layer of mould or humus, in which insects, worms, larvæ and other animalcules live and breed.

In his most interesting paper on fish diseases Prof. Huxley said that drought or flood did not seem to affect the *saprolegnia*,* but that a steady flow was beneficial to the fish.

Mr. Wilmot, Superintendent of Fish Culture, Canada, in the discussion which followed, pointed out that the disease nearly always appeared where the regularity of the supply of water had been disturbed by the destruction of the forests.

I presume therefore that both these learned and practical gentlemen will agree with me in the importance of forest protection as a means of preserving the health of the fishes.

The branchlets, leaves, decaying and decayed vegetation produce a vast amount of nourishment for the fish and one most agreeable to them. Each breeze drops into the water numberless grubs, caterpillars, beetles, flies and other insects, the food most relished by the fishes, while from the banks and roots worms and grubs are constantly supplying them with delicacies.

The shade of the overhanging trees is also agreeable to the fish and one needs only to place a board in a stream and see the fish gather underneath it to be convinced of this.

We all know that a shady deep pool is a good place in which to seek for fish, and have often observed the predilection fish have for the shady side of a stream. But not only as regards fresh water fishing can this be said. In Denmark it is a well known fact, that the best fishing is where a forest is close to the shore, and in particular where the trees, as is often the case in that country, overhang the very sea. The shade-giving trees have another and perhaps far more important effect of preventing a large evaporation, and at the same time keeping the water clear and cool in summer, while on the same account the winter frosts do not deal so severely with them. In a forest country the changes of temperature are not so severely felt as in a treeless country, or on the open plains, and the effect upon the water is even greater. It is a popular saying in Denmark of the forest streams, that they are cool in the summer and warm in the winter, this of course meaning that they present that feeling in comparison to the atmosphere. The forests not only regulate the flow of the water but they purify the water. This is an experience often demonstrated in Australia in cases where streams have been polluted by wool washing establishments. After having passed a few miles through a shady and dense forest, the water will appear as clear and pure as it was above the woolwash.

I need not here enter upon more reasons for the conservation of existing forests to insure a steady supply, or to draw your attention to the danger in not protecting them by legislation. But I will draw your attention to the advisability of cultivating forests on places suitable for the supply of water and especially along water courses and lakes, as means of purifying these, preventing too great

*A fungus or mould.

evaporation supplying food for fish and protecting them with shade against the rays of the summer sun and shelter from the prevailing rains the heavy and tempests.

Salmon fishing and all freshwater fishing depend upon proper attention to this matter and I feel certain that if the true causes were properly investigated where fish were and had disappeared from a stream in half the cases it would be found that the shade and shelter of the forests in protecting the water trees had been taken away It was said at the meeting of Sir James Lemon Mackenzie's statement later on that "Salmon" that it was not enough to place spawn and fry in a water they must be provided with proper food and the best means to do this is to preserve the forest trees and insure a steady supply of water and food by preserving the forests from whose the streams [illegible] As he before remarked it is not enough to preserve the present forest New forests must be cultivated on the barren ranges and round a stream new beats and trees [illegible] So far for the principle of the conservation of the forest.

I will now briefly mention the most suitable trees and their culture But before entering upon this I must draw your attention to the important question to be observed in the management of such forest areas as are preserved for the sake of conservation of water [illegible] In the home state of a well wooded forest are [illegible] atmospheric conditions on which depend the greatest effects of the forest in regard to climate and water conservation These results perhaps [illegible] not in these areas which are cut and worked with the greatest care and regard for the best interests of the forest and the manner in which it is carried out [illegible] the effect on the water conservation that the strongest trees would be reserved [illegible] timber most valuable for practical purposes Nature now [illegible] in a better way than we could [illegible] the ground would be kept moist and in a state favorable to the [illegible] [illegible] Now it is [illegible] there are to [illegible] forests [illegible] the minimum to be preserved of the [illegible] trees per acre due regard being of course paid to age species and health For these reasons it is [illegible] important that all such forests whether private property or [illegible] belonging to the State should be placed under the control of the State

The different trees have naturally a different effect as regards conservation of water and protection of food and shelter for fish as I will here briefly point out I have, for the matter we may divide all forest trees into two large groups the deciduous and the evergreen trees The deciduous trees of which so far as Great Britain is concerned the oak ash beech [illegible] and poplar are the most prominent have a very great advantage over the evergreens I have had occasion before to point that the [illegible] stage during summer a far more effective one in preserving a large evaporation and that the [illegible] of the ground and are more spreading than those of the latter I consider that the [illegible] seems to be far greater in these trees towards affording our streams and [illegible] forest beetles trees than they are usually the food suited The great amount of foliage and branchlets [illegible] known to these trees forms a perfect factor in the economy of nature and their [illegible] vegetation [illegible] life and food for fish

That this group is especially suited for water conservation was illustrated in a forest in Denmark where an area of fen and peat was cultivated with beech and oak After a lapse of about fifteen years a main stream which during the

one of the evergreen trees had developed to any considerable size and such proportions that the irrigation of a considerable area was affected by it because evaporating the water in advance of water As regards the evergreen trees, the best cultivation of barren ranges on high plateaux must always be undertaken with these on account of their ability to resist the severity of the climate in these exposed situations and grow on stony and poor soil But even on rocky ground and at high altitudes the conifers Cypress and other deciduous trees will often be found better for the end which we have in view the water storage and the pasticulture

In such localities where only the most hardy trees can be reared it would be practicable to create a belt of watercourses of evergreens and native trees only, over ground a few thousand feet above the trees as soon as the other trees had attained sufficient height to protect them from the storm and the frosts Several objects would be gained by this Apart the shade shelter and other beneficial effects the conifers would more valuable timber and fuel trees than deciduous trees as a rule a greater preference for damp and moist localities than the evergreens and thereby lessen the inflammable trees permit more free a luxuriant undergrowth of shrubs and annuals

A fresh water fishermen will agree with me in the advantage of having a good growth of shrubs as Watercress bottom etc near the bank and have observed that during feeding time the fish always seek out places There is a vast variety of shrubs and annuals that might easily and with great advantage be introduced and grown on the river banks but it would be outside the province of this treatise to enter fully on the theme However I may mention that many fodder plants and grasses from other countries might be a source of wealth to the population and greatly benefit the fish as well as the owners of the land if cultivated on the banks

The Prickly Comfrey (Symphytum asperrimum) which yields such a splendid forage for ruminant animals and many others are easily reared both from seed and cuttings and should be in the possession of every one who resides near the banks of rivers and creeks the average rainfall of which does not exceed 20 inches Never these barren and desolate places with vegetation and forest an object of merchandise by planting them for the use of fuel-merchants and miners in the Arctic regions The plant when cooked is a good substitute for cabbage and has a most wholesome effect on persons suffering from constipation

By a judicious forest management the soil can be kept covered constantly and always in a state favourable to the purpose of storing the water but it is important that both sides of the stream should be planted instead of cultivating these the distance on one side A great many American trees might well be introduced as for example the Swamp Cypress *Taxodium distichum* Asa a great tree reaching a height of almost 150 feet and 12 feet at the base and the Tulip tree (*Liriodendron*) Just about Sydney there are many which besides excellent timber furnishes a valuable forage from its rich foliage There are a great many more which have a good effect on the river having besides other advantages but it is particularly to the manner in which our attention should be drawn The preference which these trees have for water and particularly for running water is well known and points directly to the practicability of planting them in those localities as well suited for them The fish like myself and I have dwelt more in Australia than the best fishing places come to where some weeping willows (*Salix babylonica*) had taken the place of the indigenous and even more shady wattles (*Acacias*)

The yearly consumption of osiers in England is far greater than the national supply, and as the basket industry is constantly on the increase, it would also on this account be advisable to further the cultivation of the osier willows. For light, sandy banks, the best willow should be *Salix purpurea*, and as it is so easily propagated, it will well repay the cost of cultivation, besides binding the banks, making them firm and adding to the health of the locality as well as that of the water. For more clayey soil, *S. viminalis* and the more celebrated *S. caprea*, so much sought for powder factories, should be the best. The cuttings must be taken from the one to two-year-old shoots, and be put 1 to 1½ foot apart, in double or treble rows 2 to 3 feet apart, care being taken to leave only half an inch or less above ground.

There are many localities where comparatively valueless land, close to the mouths of rivers and canals, might be made highly profitable, at the same time as the cultivation of it with the before mentioned trees and plants would improve the state of the fishing, and, before placing spawn and fish in any water, I consider it important to pay great attention to this question. Where few or no trees exist it will be necessary to cultivate them, and I feel certain that such proceeding will enhance the chances of the success of pisciculture. I will not here enter further upon the practical details of the question. These are bound to vary with the locality, and the local foresters will know how to deal with them.

In drawing the attention of the conference to this question, it is with the sincere hope that it may enlist your sympathy, and that the public opinion may be won for it. That it is important for all fresh-water fishing is evident. That is one more reason added to the many why we should regard the forest as a precious heirloom to be deeply revered, properly used, and, through careful maintenance, descend improved and enriched to posterity.

SYSTEMATIC MANAGEMENT OF FORESTS.*

The Model Forest

Imagine a uniformly productive tract, divided into any number (n) of divisions, or compartments of equal area, the first stocked with trees one year old, the second with trees two years old, and so on in an ascending series up to the nth compartment stocked with trees n years old. And let the revolution or age at which the trees of any compartment are to be cut be n years. The land will then be permanently cut into a number of compartments equal to the number of years in the revolution, and each one will be stocked with trees one year older than those of a compartment immediately preceding it in age, so that there will be a complete series of groups of all ages from one to n years old. If now all trees n years old, that is those in the nth compartment, be cut, and the land immediately restocked with young growth, it is evident that at the end of twelve months the group of trees next in order of age, or n minus one year, at the time of the first cutting, will have advanced to maturity, while the plants on the first coupe will have taken the place of the youngest group in the series, and the plants of all intermediate compartments have advanced one year in age. At the expiration of twelve months from the time of the first cutting we may therefore again cut a group n years old, and so on forever cutting a group n years old once a year, without diminishing the standing stock.

The year's produce thus obtained is in fact the annual growth or interest of the material standing in n compartments, and is called the sustained yield, and a forest so organized is called a model or ideal forest, because it represents a state of things which is the ordinary perfect, if never quite attainable in practice.

If in the case just considered we were to cut more than the sustained yield in any year we would be trenching on the capital stock, and unable to maintain an unvarying yield. If on the other hand we were to cut less we would not be working up to the full capabilities of the forest, and would have a certain amount of capital in the form of trees living idle, and for the time being unremunerative.

A forest may therefore be regarded in the light of a capital producing by its yearly growth a certain interest in wood, just as a sum of money which is lent out produces interest, and in estimating the growth of a forest viewed as a productive money capital the rate is calculated in precisely the same way as in ordinary money transactions.

Trees of about the same age and height growing together in a mass or trees growing in a sub-compartment are called a group. A compartment may contain one or more groups; if more than one, the area occupied by each group is called a sub-compartment. The group is the smallest unit of mass, and the sub-compartment is the smallest of area, in regular forests.

The Revolution

The term revolution is used to denote the period of years which is being fixed to elapse from the time of the production of a tree or group to the time of its being cut down. It does not necessarily correspond to the age at which a tree is harvested, because trees cannot always have to be cut or die from natural causes, before the revolution fixed upon is completed.

* Macgregor; Organization and Valuation of Forests.

The length of the revolution may depend on many things such as the kind of tree and the method of regeneration to be followed subjects which are fully examined in books on sylviculture and the special objects of the proprietor

The principal objects of the latter may be classed as follows:—

To obtain from the land the largest possible average annual return (1) of material (2) of money (3) of interest on his capital invested or to adopt the revolution best suited to (4) natural regeneration or some (5) special technical purpose Revolutions fixed with a view to make such special requirements are called respectively The revolution of the largest mean yearly yield (1) in wood and (2) money (3) the financial revolution (4) the physical and (5) the technical

Choice of a Revolution

For private owners there can be no doubt as to the most favorable revolution the financial But when it is a question of forests belonging to the State it is frequently urged that not what it may it is the duty of a government to provide for a great many requirements of the community and to prevent a diminution of the supply of any kind of material No doubt a good deal may be said in favor of this view In the first place it is undeniable that forests that can be cut down any day may take years or even centuries to replace and that it would never do to rely on private enterprise for the supply for the largest timber more particularly as it seldom pays to grow it Again experience teaches that private individuals cannot be relied upon to provide even small timber or fire wood which does not pay the temptation to exceed the capability of the forest, or to convert all the standing stock into gold whenever money is required by the proprietor is irresistible and not to be restrained by other people's ideas of moral obligations to themselves and posterity

Now without denying that circumstances (as in the case of protective forests) are conceivable which would render it advisable for a State to keep a forest standing after it had reached financial maturity advocates of the financial revolution may reply as follows As a general rule, it is the business of a government to make the most of the property entrusted to its charge rather than to anticipate and provide for highly improbable contingencies which if they ever did threaten to arise would certainly not in these days take everybody by surprise.

The government timber forests of all civilized countries are of vast extent, Spain perhaps alone excepted They are are all systematically managed or in a fair way to be so and could not therefore be swept away as if by magic nor the standing stock suddenly reduced to a great extent because that would involve the sale of largely increased quantities of wood which could not be quickly disposed of without greatly depreciating its value In a well regulated forest therefore the financial revolution would act as a self adjusting measure of the requirements of the people and act as a regulator of the supply in sympathy with their most pressing wants.

Natural Regeneration of Woods.*

In forests naturally regenerated by seed the mother trees are only gradually removed, and several cuttings go on at once In every rational method of working a forest reproduction ought to be the result of the cuttings themselves

*Nagouris: Elements of Sylviculture.

This is one of the essential objects of the science and art of sylviculture. Thus in the different kinds of high forest, reproduction is obtained from seed shed by the trees under conditions favorable to germination, while in coppices it is obtained just as naturally, by means of the shoots principally and secondarily by means of the seeds furnished by the standards.

But whatever the precautions taken in both descriptions of forest there are often spots where seedlings do not come up, or where stools die and leave blanks. At other times it may happen that the reserve does not contain a sufficient proportion of a given species, a mixture of which is necessary, or that this species has disappeared owing to indiscreet operations or the total absence of all operations. In each of these different cases recourse must be had to artificial means in order to restore the good condition of the forest or a satisfactory composition of the crops. But such means ought to be the exception not the rule. It cannot become general and take the place of natural methods. To abandon natural reproduction is only to retrograde, to return to the infancy of the art, it is tantamount to claiming to supersede the forces of nature, above all it is simply wasting money under the false idea of economy, only to arrive in the end at results which are at the best doubtful.

Nevertheless, artificial restocking cannot be totally proscribed. It forms the necessary complement of natural regeneration, but it must remain only its complement. Hence it is necessary for the forester to know how to do it well. Besides this, it is the only method of stocking extensive treeless wastes.

Regeneration by Seed.*

Regeneration by seed is applicable to all species, that by shoots and suckers applies only to broad leaved species, since the power of reproduction of conifers by shoots is either absent altogether, or so feeble that it is useless for sylvicultural purposes.

Under natural regeneration by seed is understood the formation of a new wood by the natural fall of seed, which germinates and develops into a crop of seedlings. The trees which yield the seed are called the *mother trees*, they may either stand on the area which is to be restocked, or on adjoining ground. A distinction is made between—

(1) Natural regeneration under shelter-woods,

(2) Natural regeneration from adjoining woods.

In natural regeneration under shelter-woods the area is stocked with seed-bearing trees, and the new generation springs up under their shelter, for some time at any rate, the area bears the new crop and part of the old one.

The system is that which occurs in primeval forests. When a tree falls from old age, or other cause and an opening is thus formed in the cover overhead, the seed falling from the adjoining trees germinates and develops into seedlings, these grow up under the shelter of the older trees, until they in their turn become mother and shelter trees. In this manner primeval forest, if undisturbed, goes on on regenerating itself for generations. The process is a slow one, as the young crop will only develop when sufficient light is admitted by the fall or death of the old trees. In sylviculture it is accelerated by the artificial removal of a

* Schlich, A Manual of Forestry.

portion of the old trees, when they have become fit for economic purposes. By degrees, modifications have been introduced which lead to a number of distinct methods —

(1) *The selection system.*

(2) *The group system.*

(3) *The compartment system.*

(4) *The strip system.*

In each of these there are certain general conditions of success which hold good for all.

Under the selection system regeneration goes on in all parts of the forest by the removal of the oldest, largest, diseased or defective trees, wherever they are found. No part of the forest is ever at rest; advantage is taken of all seed years for the restocking of small holes cut into the cover here and there by the removal of one or a few trees. Of the large quantities of seed which fall annually or periodically to the ground only a small portion finds conditions favourable for the development of young trees; the latter are found chiefly in those parts where old trees are standing, or where the cover has been interrupted. Here little groups of seedlings spring up, which must be assisted by cuttings either final or intermediate, to afford them the necessary light.

Choice Between Direct Sowing and Planting

Formerly the artificial formation of woods was chiefly effected by direct sowing, planting being restricted to special cases where the other method was not likely to succeed. The reasons for this were that sowing was considered to be more certain, cheaper, and that it was generally the custom to use too large transplants. In the course of time the raising of plants was elaborated, smaller plants were used, and the expense considerably reduced, so that now far more planting than direct sowing is done.

Yet it is not always a foregone conclusion that planting is better or more suitable than direct sowing, since many different conditions and factors affect the ultimate results. The effect of some of these factors is as yet somewhat obscure, but in many respects experience has taught the forester which of the two methods is preferable under a given set of conditions.

Sowing and planting are costly. The outlay on the latter can, however, be considerably reduced by planting small plants according to a simple and cheap method.

Where artificial regeneration follows clear cutting, the young plants are exposed to damage by frosts, drought, insects, and weeds in a far higher degree than if the regeneration is conducted under a shelter-wood. In fact, tender species must be raised in the latter way, so that for them clear-cutting is excluded. Insects frequently become formidable to coniferous woods raised in clear cuttings, while experience has shown them to be less dangerous to natural seedlings, especially when these are raised under a shelter-wood.

In the case of clear-cuttings, the laying bare of the ground for a series of years may seriously affect the fertility of the soil so much so that the method is hardly admissible on inferior soils.

Natural regeneration involves less expenditure than sowing or planting. In some cases the outlay may be absolutely *nil*, but in most cases some artificial help has to be given either by working (wounding) the soil, or by sowing and

planting Still the outlay is considerably smaller It must, however, not be overlooked that in the majority of cases natural regeneration requires much time, as long as the shelter trees increase sufficiently in size and quality so as to make up for any loss on this account no harm is done, but where this is not the case artificial regeneration may be actually more profitable.

Damage by frost, drought, and weed growth is avoided, or at any rate considerably reduced. The same may be said as regards damage by insects, though perhaps not to an equal extent.

Summing Up

Neither the artificial nor the natural method of regeneration is the best at all times and under any circumstances, only a consideration of the local conditions can lead to a sound decision as to which is preferable in a given case. In forming such a decision the forester must chiefly take the following points into consideration:—

(*a.*) General objects of management.

(*b.*) Species to be grown.

(*c.*) Condition of locality

(*d.*) Available funds.

(*e.*) Skill and capacity of the staff.

Labor Required in Forestry.

Forests require labor in a great variety of ways, which may be brought under the following three headings:—

(1, General administration, creation, tending, harvesting, etc., or work done in the forest.

(2) Transport of produce.

(3) Industries which depend on forests for their prime material

(1) *General Administration.* The quantity of labor required in the forests differs considerably according to circumstances, the value of the produce, and the consequent degree of the minuteness of the system of management. Great difficulty is experienced in obtaining accurate statistics on this point, but five days work annually for every acre of land under forest may be accepted as an approximate estimate all round. From the available data it has been calculated that in the forests of Germany about $39,000,000 are paid annually for administration, creation, preservation, road making, cutting of wood, and collection of minor forest produce, on which about 200,000 families exist, or about 1,000,000 people. This estimate refers to forests which are already in existence, and in which fencing is done only in very rare instances. When new forests are created, additional labor is required at the outset. Nevertheless it is beyond doubt that forests require considerably less labour than land under field crops.

(2) *Transport of produce.* Owing to the bulky nature of forest produce its transport forms a business of considerable magnitude. Timber and firewood are carried by water wherever practicable, but also extensively overland. Under this head the sum of at least $19,480,000 is paid annually in Germany

(3) *Forest industries.* The labour which is required to work up the raw material yielded by forests is of a much greater extent than that employed in managing the forests and in transport. There are the workmen employed in

saw-mills, building, ship-building, carpentry, coach building, engineering, turning, carving, paper pulp manufacture, match making, the manufacture of cases, and boxes, round and square, from the largest packing case to the smallest toy box, frames of sieves, drums and cask hoops, wooden-ware for table covers, baskets, pencils, wooden nave, instruments, tools, plates, shovels, spoons, shoes, lasts, saddle-trees, brushes, harrows, and gunstocks, toys of thousands of patterns, and endless other branches of industry, some of which can only exist in and around forests.

The wages earned under this head amount in Germany to something like $146,100,000 a year, maintaining 600,000 families or 3,000,000 people.

Taking now the three heads of labour together, it has been estimated that something like 12 per cent of the population of Germany is employed in forest work, transport of forest produce, and the working up of the raw material yielded by the forests. An important feature of the work connected with the forests and their produce is, that a greater part of it can be made to fit in with the requirements of agriculture, that is to say that it can be done when field crops do not require attention. Hence forest work offers an excellent opportunity to the rural labourer or small farmer of earning some money when he has nothing else to do, and when he would probably not have, if no forest work were obtainable.

Organization of the Personnel.*

This will depend in a great measure on the extent of the forest concerned. It is evident that the degree of division of labour which is possible in the management of forests comprising a million acres could not be applied with advantage to an estate of a thousand acres, and that private individuals will seldom be in a position to adopt the elaborate systems followed in the State Forests of European countries.

The following plan is that usually adopted for the management of forests of large extent, such as those of most European countries.

The establishment consists of an inferior and a superior branch. The former consists of (1) guards and (2) rangers.

(1) *Guards or Under-Foresters.* The duty of these is, as the name implies, in the first place protective. But, besides this, they are employed in the executive work of their beats, as, for instance, in supervising work of regeneration and felling.

(2) *Rangers*, or range foresters, who have immediate charge of the executive work of a *range*, and are responsible for its proper conduct to the assistant conservator.

The superior branch consists of (1) Assistant Conservators, (2) Deputy Conservators, (3) Conservators, and, in certain cases, of (4) an Inspector-General.

(1) *Assistant Conservators.*—An assistant conservator has charge of several ranges, called collectively, a *sub division*. Besides the general management of the work of the sub-division, the accounts of each range are audited, and have to be passed by him before payment is made.

(2) *Deputy-Conservators.* A Deputy-Conservator has charge of several sub-divisions, called collectively, a division. His duty is purely to control, and he does not, as a rule, interfere with the executive work of the Assistant-Conserva-

* Macgregor, Organization and Valuation of Forests.

tors, but it is his business to see that the general provisions of the sanctioned working schemes and yearly budget of his division are properly carried out, and to audit and pass the accounts of the sub-divisional officers.

(3) *Conservators.*—A Conservator has general control of several divisions, collectively called a circle, comprising all the forests of the State, or, if they are very extensive, of a Province only. He is the immediate adviser of government in all forest matters concerning his circle; holds in fact, in this respect, much the same position as an under-secretary of State, and usually has his headquarters at the seat of Government.

(4) *Inspectors-General.*—An Inspector-General stands in the same relation to a supreme government as a conservator to its local government, and exercises a general supervision over the whole system of a country.

It will be observed that by this system the administration is divided into an executive and a controlling branch, the former consisting of Assistant-Conservators and their subordinates, and the latter of Deputy-Conservators and officers of superior rank.

Members of the inferior establishment do not, as a rule, rise higher in the service. A much lower standard of technical and general education is demanded from them than from the members of the superior branch, and they are, therefore, generally unfitted for the higher appointments.

The size of ranges, sub-divisions, divisions or circles depends on local circumstances, such as the degree of intensiveness of the working, compactness of the forest area, mode of treatment, and means of communication. It is, for instance, evident that, other things being equal, a Deputy-Conservator could manage a larger division where there was railway communication than where there was none. It is equally obvious that a ranger could manage a much larger forest worked by the method of equal areas, and solely with the view to producing firewood coppice, than a seedling forest worked by the combined method with a view to the production of large timber and naturally regenerated.

Choice of an Organizer.

Should the sub-divisional officer who has been in immediate charge of the forest, perhaps for many years, be intrusted with a preparation of a plan, or should a special branch of the executive be employed, whose sole business is to prepare plans of management?

In regard to this question, opinions are divided. Of course it is one which can only arise in regard to large tracts of forest belonging to one proprietor—the State for example. A small proprietor would not be able to keep a special staff fully employed.

It has been urged in favor of the local officials conducting the organization and revision of a forest, that he must know the special conditions far better than other people, and that he would take much more interest in the carrying out of his own programme than that of another.

On the other hand, it has been maintained that the special practical knowledge and skill necessary to organize a forest successfully cannot be acquired in the ordinary routine of an executive officer, who would probably not be called upon to carry out a work of this kind more than a few times during his whole career; that by constant practice a special branch would attain the necessary proficiency; that if the work is done by a small body of men, it is more likely to

be uniformly carried out than by a number of different persons, that the officer in charge is not the proper person to revise his own work that he will be always there to assist and advise the organizer

A large majority of countries including India, have adopted the system of having works of organization carried out by a separate branch of the service, and some have gone still further and constituted a distinct survey branch as well as an assessment branch As a rule the separation of these two departments is not desirable Perhaps it conduces towards efficiency, if a part of the staff is exclusively employed in surveying and the other in assessment but the work of the two is so intimately connected that it is expedient they should both be under one head

The composition of the organization staff depends on special circumstances Sometimes a good plan is to have a board of senior officers presided over by the principal officer All organization schemes are submitted for the approval of and have to be passed by this board the members of which carry on the work in addition to their ordinary controlling duties Under the board is the working staff which carries out the works of organization and which is recruited by drafting men into it from the ordinary branch of the service after they have served a few years and become thoroughly acquainted with the working of a sub-division

This system is only suitable for districts in which the headquarters of the controlling officers on the board are all in one place Each member looks specially after the working of the plans in his own division, and generally conducts the revisions in person

An important duty of the organization branch is to collect and work up statistics The business of collecting statistics and drawing general conclusions is best done by a central institution of this kind and much useful work would often be lost without a trained staff whose special duty is to work up details connected in different parts of the country the "Bavarian tables" which have proved so useful not only in Bavaria, but throughout Germany are a case in point they would probably never have been constructed if there had not been a central organization department at Munich

Speaking generally, the bent of the argument appears to be in favour of having this kind of work done by a special branch, but not always as circumstances may without doubt arise which render the alternative course advisable as, for instance when the aggregate area of forests requiring to be organized is so great that their organization could not be accomplished within a reasonable period by a necessarily limited staff or when the methods to be employed are so simple that their execution does not require any special skill.

FORESTRY IN THE COLONIES AND IN INDIA.*

A circular containing questions relating to colonial timber was addressed by the Secretary of State for the Colonies to the administrative heads of the various British possessions in 1874, from the replies to which it appears that in none of the six Provinces of the Dominion had measures been taken to secure the replanting of cleared areas, or the afforestation by natural reproduction, notwithstanding an enormous and growing consumption.

In the Province of Ontario more than 87½ per cent. of the timber annually cut was exported, and, looking to the magnitude of the timber exports, it was remarkable that so little had been done to prevent the threatened exhaustion of the chief article of trade in the Province.

In Nova Scotia the amount of timber annually cut was estimated to exceed by 25 per cent. the amount which could be cut each year without permanent injury to the forests, while in Prince Edward Island the amount annually cut exceeded nearly seventeen times the quantity which would represent a prudent rate of consumption.

The timber resources of British Columbia were declared by local authorities to be practically inexhaustible, but it is probable that, should the whole strain of the demand be thrown upon British Columbia, a few years would make a very perceptible inroad upon the stock of native timber situated in accessible districts of the Province.

The importance of this trade to the commercial prosperity of the Dominion will be exemplified by the following table, compiled from materials contained in returns issued by the Board of Trade.

Comparative tables of money values of timber and corn (grain) exported to the United Kingdom during five years ending 1876.

Articles.	Value.					
	1872	1873	1874	1875	1876	Total.
	$	$	$	$	$	$
Timber and wood	4,218,661	5,220,296	5,706,567	4,205,045	5,282,657	24,633,226
Corn and grain	3,003,104	3,898,304	3,697,616	3,124,056	2,814,003	16,536,983

Timber and corn (grain) are the chief exports of the Provinces of the Dominion, but the value of the timber exports exceeded the value of the corn exports by more than one-third, and constituted nearly one-half of the total value of all the exports from the Dominion to the United Kingdom.

The returns exhibit, in a striking manner, the urgent need for some prompt and comprehensive action to stay the influences at work to destroy the indigenous forests, which constitute, in many instances, the principal natural riches of the colonies. There is a tendency in newly-settled countries to regard the timber as

* Schlich. In Proceedings of Royal Colonial Institute, vol. xxi., 1889-90.

a mere encumbrance to the land and the most timber is that first selected for destruction by fire by ring barking and other rude and wasteful methods in favour with settlers.

It is probably not possible in newly settled colonies to put restraints upon the clearing of the most fertile areas although it would seem to be advisable to leave belts for protection against the winds and to ensure that all the hills should be preserved in perpetual forest to protect the sources of the springs.

In many cases the reports of surveyors general and other officials demonstrate the necessity of preserving and even of restoring the forests by the constitution of a strong but energetic forestry department but nothing worthy of notice has up to the date of these returns been done in the nature of forest conservation.

New Zealand.

The subject of forest conservation appears first to have engaged the attention of the Colonial Legislature in October 1871 when a motion was made and agreed to that "steps be taken to ascertain the present condition of the forests of the colony."

In the course of a parliamentary debate in 1873 it was remarked with reference to the kauri wood that extensive districts which were once covered with that wood were then to a large extent bare of it and that its extermination progressed from year to year at such a rate that total extinction was as certain as that of the tui in New Zealand. Another speaker remarked that "unless great care was taken there would not be a kauri tree in the country in the next generation."*

As the result of the agitation of this question an act was passed by the Colonial Legislature in August 1874 entitled "An Act to provide for the establishment of State forests and for the appropriation of the revenue derivable therefrom." The preamble recites that it is expedient to make provision for preserving the soil and climate by tree planting for providing timber for future industrial purposes, for safeguarding some portion of the native forest to skilful management and proper control and for these purposes constitute State forests.

The Act provides that an annual sum of £10000 for thirty years is to be paid quarterly out of the Consolidated Fund into a special fund to be called the "State Forests Account" and all receipts from State forests are to be paid into this account. The moneys to be expended in managing and planting State forests and nurseries and the establishment of schools for instruction in forestry. The department is placed under the supreme control of a minister of the Crown, who is to be assisted by a conservator and subordinate officers. Lands may, from time to time be set apart as State forests on the recommendation of the superintendent or of the Provincial Council of any Province. Power is taken to set aside pastoral leases or licenses over lands so selected.

The Governor in Council may make alter and repeal by laws and regulations—

Prescribing the duties of officers.

To regulate the form and issue of licenses.

*Kauri, *Dammara Australis*. A conifer the largest and most valuable timber tree in New Zealand. Attains a height of 120 feet and diameter of 6 feet to 8 feet. Timber used for spars, masts, and planking. Exudes large quantities of resin known as kauri gum. Weight 30 to 34 lbs per cubic foot, grows in sandy soils. The above remarks as to the kauri will apply to our most valuable hard wood tree the Black Walnut.

To control the management of the forests.

To determine the seasons for the cutting and removal of timber and bark

To prevent waste and unnecessary destruction

To prevent the danger and spread of fire

To prohibit trespass and regulate access.

For constructing roads and tramways in the forests and charging of tolls.

The Act also provides for the punishment of offenders and for the application of money recoverable as penalties.

As a practical and comprehensive experiment in the direction of forest conservancy, the results were looked forward to with interest.

Australia

Australia proper consists of the colonies of New South Wales, Victoria, Queensland, South Australia, and Western Australia. The causes which determine the climate of Australia are remarkable in many ways. In the first place the northern parts of the country are situated in a tropical and the southern parts in a temperate latitude. Secondly between the two stretches the enormous central plain is daily heated in summer to a very high degree, the air expands, is lifted, and flows away on all sides, causing an indraught of moist sea air. This is forced to rise on reaching the high coast lands, which it moistens in various degrees. Owing however, to the great distance from the shore to the centre of the country the latter profits only at regular intervals by this, because the indraught is regularly stopped by the nightly radiation of the heat absorbed during the day, or the clouds are once more converted into vapour owing to the high temperature of the air.

Such is the heat of the interior during the summer that the air if it moves at all feels like a furnace blast. Sometimes, however, sufficient masses of clouds succeed in passing over the coast ranges and, in such cases, floods of rain fall upon the inland country. The distribution of the rain differs considerably. The north coast has the advantage that the air drawn in from that side comes from the equatorial regions, the great reservoir of moisture.

Then the hills on the east coast are comparatively high, those on the west coast are lower, and along a portion of the south there are no mountain ranges at all. Thus it happens that the rainfall at the head of Spencer's Gulf is only 6 to 8 inches; at Adelaide, 20; Melbourne, 26; Portland, 32; Sydney, 48; Newcastle, 44; Brisbane, 49; and at Rockingham Bay something like 90.

In every part, however, the rainfall decreases rapidly in passing inland, so that comparatively little falls on the inner slopes of the coast ranges.

The temperature depends on the situation and the rainfall. The northern part of the continent is tropical. Brisbane has a mean annual temperature of 68 degrees Fahr., Sydney 64 degrees, Melbourne, 57 degrees, and Adelaide, 65 degrees.

The mean temperature in the interior is much higher than along the shore, it is said to rise as high as 130 degrees in the shade during summer.

South Australia was perhaps first in the field to introduce a separate forest law

In Victoria a new Land Act was passed in 1884, which provides, amongst others, for the following matters :—

(1) The formation of State forests

(2) The formation of timber reserves

(3) The management of both

4 The management and disposal of timber and other forest produce on the unalienated Crown lands is not included in the State forests and timber reserves.

Under this Act the State forests can only be alienated with the consent of the Governor in Council. The timber reserves shall not be alienated in the first instance, but as the several parts become destitute of timber, they may be added to the pastoral or agricultural lands, in other words thrown open to selection. The timber reserves are, therefore, only temporary reserves.

The forests generally are worked under the licence system regulated by rules made under the Act. There are licences for felling spars, cleaning under growth, the erection of saw mills, grazing, removal of wattle bark, etc. For each of these licences certain fees are paid. Penalties are provided for breaches of the law, or any regulations issued under it.

The question is whether and in how far, effect has been given to the policy which is indicated in the Act. Mr Vincent an expert and a trained forest officer of known ability, who served in the Indian Forest Departments since 1874 gives the following description of forest management in a report to the Governor of the colony as existing in 1887.

The area of State forests and timber reserves then stood as follows :—

State forests	64,710 acres,
Timber reserves	80,732 "
Total	1,355,442 acres.

Equal to 2,118 square miles or about 2 per cent. of the area of the colony.

Mr Vincent visited a number of the State forests, timber reserves, and other forest lands and he draws a rather gloomy picture of their condition.

This is what he says for instance about the Woolast and Bullarook forest area, 150,000 acres. This is said to have been originally a magnificent forest chiefly of messmate or stringy bark, the timber being of the very best class, enormous quantities have been sent away to Melbourne, Sandhurst and Ballarat ; there were thirty-six saw mills at work in 1884 ; the splitters have cut more timber than even the sawmillers ; the good timber is now almost all worked out, except in certain localities in the southern half of the forest. In the portion which I visited there are only seven or six trees with a certain number of stagers ones which have been left for some fault. There has been little or no reproduction ; the whole of the young trees have been cut out ; there are no timber seedlings coming on to yield timber some twenty or forty years hence.

The useless waste and destruction that have been going on in this forest for the past thirty years defy all description. The saw millers and the splitters have been allowed to go in and cut what they chose, leaving behind them the fallen trees, the great fire-scarred trees, leaving the rest which although not quite so good as those they took, still formed the forest timber. The splitters as often as not left trees to rot where they had fallen without even taking out one log on finding that the wood did not split well. Even if they did split a

least three-fifths of the timber in the trees was wasted. Subsequently, when the wood that was left on the ground was fired, a fierce heat occurred which killed or rendered useless a great deal more timber than had been felled. The question of the State forests has not been dealt with here for some of the best forests have been left outside, and inferior growth taken up for the reserve.

As a large increase in the consumption may be safely anticipated taking into account the natural increase in the population, the present rapid extension of quartz mining and the increase of timber on private lands there is likely to be a great scarcity of timber in the next twenty-fifteen years. Already the mining community complain of the great increase in the price of firewood and of timber, and the report shows that the large area of forest lands in the vicinity of the mines is rapidly disappearing. The mine owners have had rents now 30 to 40 per cent. more than they were some years ago, and there is a universal complaint that the timber now supplied for props, laths, etc., is very inferior and immature.'

Mr. Ireland then sums up as follows:—"The immediate causes of this are the bad system under the re-arranged constitution of State forests timber reserves and forest lands, the absence of professional foresters to direct operations and the neglect to reserve the best natural forests. The officers in charge of the forests have often protested against the present system, explaining that the forests were being rapidly ruined. They explain that they cannot protect the forests from theft and yet no change is made. Why? Because Parliamentary influence is brought to bear by the saw-millers and by the settlers who are interested in any change that is made in the present arrangements. Both these causes are powerful in the districts represented. When an attempt is made by the Conservator of the Secretary of Agriculture to do justice to the forests and to protect them the persons affected by any depredations question the action in Parliament and endeavour to get it overthrown. There is little hope of the forests ever receiving proper treatment until the forest question is made a matter entirely apart from and free from the areas of party politics. The questions are the most to be prepared to answer the saw-millers and settlers to devastate the remaining forests, stating them and their children of their enjoyment of timber and firewood, and causing some of the climatic changes which are traceable to the destruction of forests? Are they prepared to sacrifice a source of large and increasing revenue to the demands of a limited class?"

It was suggested that the Victorian Government should secure the services of a fully competent forest expert, a man like those who introduced systematic forestry into India, who should be directed to go round the country on foot or on horseback, prepare what in his opinion ought to be done. After all the preparing of the laws is not such a difficult thing. What is of much greater importance is the determination to carry the laws into effect when once passed.

Under any circumstances the Government of Victoria should not fail to realise that the immediate establishment of extensive planted areas will make up for the loss of the natural forests. One important step to be taken is to gazette and demarcate on the ground a sufficient area of reserved State forests and to provide for their systematic management, securing to the settlers rights of way through the forests and in addition to take what measures are necessary and practicable for the protection of the forest growth on the Crown lands which are not included in the reserve State forests.

The following short abstract indicates what appears to be required:—

1. Engagement of a thoroughly competent forest expert to be the head of the Victorian Forest Department.

(2) Selection, demarcation and legal formation of a sufficient area of reserved State forests, suitably distributed over the country systematically managed and efficiently protected.

(3) Protection and disposal of forest produce on Crown lands not included in the reserved State forests.

If the Government makes up its mind to do this all the details will settle themselves easily enough.

India

India has to provide an enormous population of 255 000 000 people with timber and firewood and apart from a certain amount of teak and fancy woods, that country can probably do little towards an increased export of timber.

There are certain reasons why State interference is more called for in the case of forestry than in most other branches of industry. Most of our valuable timber trees require long periods of time to ripen. Large-sized oak trees are from one hundred to two hundred and even more years old. The teak which comes to England from India is derived from trees which are on an average at least 150 years old. If forests are to yield a regular annual return of timber they require to have trees of all ages and consequently a considerable accumulation of material which has been produced in the course of a long period of time. To maintain the forests in that condition only a quantity equal to that which grows annually should be removed and no more. If more is removed a reduction of the present capital must ensue. As long as the estates are in the hands of private parties they are at all times liable to be overworked, that is to say, more than the annual increment is taken out, and it is easy to see that in a comparatively short time the forests must cease to yield timber. Experience has proved over and over again that this is generally the result. If we are to make over to our children the forests in an unimpaired condition they must be treated in a systematic manner and this can as a rule only be secured for any length of time by State interference. But the mere theory of such is by no means sufficient. Nominal interference on the part of the State is the most disastrous of all. In that case the forests are looked at as common property and everybody tries to get the most out of them and into his own pocket, the result being that they disappear faster than ever.

If the State as such has arrived at the conclusion that the maintenance under forest of a certain proportion of the area is essential or desirable it must also once for all decide to do what is necessary to secure that area, and to see that it is managed in a systematic and orderly manner. There are various ways of doing this. Either the State establishes State forests by setting aside certain areas at its disposal for forest purposes or it passes laws which empower it to supervise the management of communal and even private forests. The former alternative is much the best wherever it can be adopted and this is the case in India and in most of the Colonies.

Practically only India has really and honestly dealt with the forest question. Some of the Colonies are fairly in earnest but too many have restricted their action to nominal measures.

India is situated between the 8th and 35th degrees of northern latitude, hence the southern half of it lies within the tropic. Its length as well as its

greatest breadth, is about 1 900 miles, leaving out of consideration the newly-acquired territory of Upper Burma. The area and population stand as follows —

	Area in square miles.	Population. Total.	Per square mile.
British Territory without Upper Burma	912,000	203,000,000	221
Native States	531 000	53,000,000	96
Total	1,443,000	255,000,000	179

The physical configuration is very peculiar The country consists of three great sections :—

(1) The Himalayas.

(2) The Indo-Gangetic Plain.

(3) The Peninsula.

The Himalayan ranges stand out like a high wall on the north separating India from the Thibetan high plateau. The great Indo-Gangetic plain runs along the southern edge of the Himalayas from Sind in the west to the Bay of Bengal in the east. To the south of this plain, and partly surrounded by it, lies the Indian peninsula, forming another plateau of moderate elevation. The contrasts of elevation which occur in these territories are greater than those in any other part of the globe. While the Himalayas reach a height of 29 000 feet, the plain of Hindustan, at the foot of the hills rises only a few hundred feet above sea level, further south elevation increases again, since the peninsula shows a height ranging between two thousand and eight thousand feet.

Another peculiar fact is that India receives the drainage of both slopes of the Himalayas, which ultimately collects into the three great rivers, the Indus, Bramaputra, and Ganges. The first two rise in close proximity to each other at the back of the Himalayas, one runs towards the west and the other towards the east until both break through the Himalayas—the former running through the Punjab and Sind to the Arabian Sea, and the latter through Assam and Lower Bengal to the Bay of Bengal. The Ganges drains the greater part of the south face of the Himalayas, finding its way, after uniting with the Bramaputra, into the Bay of Bengal The highest part of the peninsula is situated along its western edge, in consequence of which the greater part of the drainage from this part of the country goes in an eastern direction into the Bay of Bengal.

It will be easily understood that in a country like India many different climates are found As a matter of fact, they range from the driest in Sind to the wettest along the west coast of the peninsula, in Assam Eastern Bengal, and Burma and again from the hottest to an arctic climate in the highest regions of the Himalayas. Of these various climates the following four types may here be mentioned as most characteristic :—

(1) The climate of tropical India Showing the highest average temperature, the early arrival of the monsoon rains mitigates the summer temperature, there is little or no cool season.

(2) The climate of North western India Showing the highest summer temperature, though the average temperature of the year is lower than in the

former region there are four or five cool and even cold months having winter when the climate resembles that of South Italy

4 The climate of North-eastern India Here humidity reduces extreme the extremes of temperature in summer and winter are moderated by the effects of the relatively large quantities of moisture in the air

5 The climate of the Himalayas It is necessary to consider more than temperate and even arctic conditions cool and bitter winds in winter and a moderate heat in summer

The rainfall depends on the heat and on the movement of these areas The extensive plains and table lands of India are in spring and summer heated to a much higher degree than the surrounding sea whose lying within the air overlying the sea is warmer than that over the dry land in other words sea breezes prevail in summer and land breezes during winter

In spring, which here comprises the months of March April and May the greatest heat is found in the centre of the peninsula Nagpur has a mean temperature of 86 degrees from this it falls to 77 degrees on the west coast and to 75 degrees on the east coast at the foot of the Himalayas The air is the driest experience On the higher levels rainless days are common and produce a contrast of temperatures low pressure prevails in the centre pressure the heavier atmosphere from the surrounding country pushes in from the sea in the south east and west and from the table land of Iran Afghanistan and Afghanistan on the west and north west As a rule the heat and dryness grow as the season advances and by a rapid rise ranging from three to six inches during this period The north western breezes on the other hand are dry and hot as they blow off the heated Deccan plateau the north western provinces and Central India When the south west monsoon arrives it becomes stronger and stronger and the air which comes from the moist Arabian sea, instead of the great masses of moist air that now cover a region known as the south west monsoon The amount of rainfall thus brought very considerable according to the configuration of the country in other words according to the degree to which the moisture laden winds are forced to rise or sink again, owing to a rise or fall of the surface

As long as the sea winds are sufficiently strong to keep a check and even force back the north western winds as is usual the Indian Ocean is the principal source that is to say the south west winds have taken up the sea winds and poured forth on the Indian plain and the peninsula If the south west monsoon lasts for some time the rains fall and crops are even famine is the result

In September the monsoon commences to lose its force by degrees north east trade winds replace the south western and southern winds They usually commence in part of Madras where they bring heavy rains until December and are known as north east monsoon winds Local rains of moderate extent are caused during winter more especially in the Punjab and North western Himalayas

The total annual rainfall ranges from 4 inches in some parts of Sind to more than 400 inches in the Khasia Hills and all intermediate grades are likely to be represented

A country which shows such extremes of climate must necessarily show a most varied vegetation The natural distribution of the forests is principally governed by the rainfall Where that is favourable production is great and the forests are dense where it is unfavourable production proceeds at a slow rate Again the nature of the rainfall governs the character of the forests Where the rains are heavy the country is generally covered with evergreen forests,

where it is less copious the forests are deciduous, under a still smaller rainfall they become sparse, and more dry until they gradually end in desert. Consequently the evergreen forests are found along the moist west coast of the peninsula, in the coast districts of Burma, Chittagong, and along the foot and lower slopes of the eastern Himalayas. The deciduous forests occupy the greater part of the peninsula and Burma away from the coast. Dry forests are found in Rajputana, and the Punjab, while deserts are the principal feature of Sind.* With rising elevation in the hills the forests become gradually temperate and then Alpine until they disappear altogether on approaching the lower limit of the eternal snow.

These details on the great variety of climates prevailing in India are given, because some idea on the subject is necessary so as to understand the forest policy which is indicated in the case of that country. The main issues of that policy depend on the following three points:—

(1) Forests in relation to climate and rainfall.

(2) The regulation of moisture, and

(3) Forest produce required by the country.

The south west monsoon must for ever be the main source of moisture in India, and the climate and rainfall of the Indian plain and of the peninsula, are generally subject to other influences, in comparison with which the effects of forests must always remain small. On this account then, afforestation cannot be pushed in the case of India. It must however, be mentioned that the shade and shelter of forests will be most gratefully accepted by man and beast in a hot country like India.

In a tropical climate like that of India, the evaporation from an area exposed to the full effects of the sun is probably not less than four times that from an area which is covered by a dense growth of forest vegetation; hence afforestation is of great importance wherever the rainfall is limited, or unfavorably distributed over the several seasons of the year.

Then, there is irrigation to be considered. No less than 30,000,000 acres of land are artificially watered in India by means of canals, wells, lakes, and tanks. Only three million acres depend directly on the melted snow of the Himalayas, and it will easily be understood of what importance it is to keep the areas which provide the remainder of the water properly sheltered. The larger the proportion of the catchment areas, whence the irrigation water comes, is stocked by forest vegetation, the more favorable and sustained will be the supply of water. On this account, then, forestry in India has an important mission to fulfil.

The mechanical action of forests in regulating the flow of water from hillsides also is not without importance in India, and cases are by no means rare, which show the mischievous effect of reckless deforestation. In this respect, none is more instructive than the case of the hills behind Hoshiarpur in the Punjab. These, consisting of a friable rock, were safe until, some forty years ago cattle graziers settled in them and destroyed the forest and other vegetation. Since then a process of erosion has set in, which is carrying by degrees the hills into the plains, where they appear as huge sand drifts which have already covered enormous areas of fertile cultivated land and even destroyed part of the town of Hoshiarpur. Such an evil can be avoided by preserving the natural vegetation on the land, but, if once started, special measures are required to meet it. In the

*Sind has some very valuable forests, which are situated on the banks of the Indus on land more or less regularly inundated.

first place grazing must be stopped at any rate that of goats and sheep so as to allow a natural growth of plants, shrubs and trees to come up. Artificial sowing and planting must be done wherever in bad cases by the construction of fence and ditches to steady the soil until vegetation has once more laid hold of it. Mischief of this kind can be stopped and cured at a comparatively small sacrifice provided it be taken in hand at an early stage; but if it has been allowed to grow for a series of years the expenses of checking the evil may be beyond the means of the State.

Although forests are of considerable importance in India in respect of their action as regards the regulation of moisture they are absolutely indispensable on account of the produce which they yield. Over by far the greater part of India must rely on the timber and fuel produced in the country apart from other produce. In the towning districts of India use wood for their domestic buildings, if such a material also. Wood cutting the latter being much to be deprecated from an agricultural point of view. At the same time enormous quantities of timber are required for construction, boat building, agricultural implements, railways and other public works. It would therefore demand for many important items of other produce more especially native fodder in the drier parts of the country it will easily be understood that at least 20 per cent. of the total area requires to be kept under forest. Even such an area would give only about half an acre per head of population an allowance below that of most European continental countries.

The history of forestry in India is very instructive. According to the available evidence the country was formerly covered with dense forests. Then settlers gained on the country using the forests as they did but the destruction of the forest on a large scale was carried out by nomad tribes who lived by cattle and pasture and moved from one part to another. This process is believed to have gone on for more than 2,000 years. Subsequently came British rule and with it a more settled condition of the forests than before. Extension of cultivation became the order of the day and the destruction of many of the remaining woods for timber to be imported being made an important result. Simultaneously with the extension of cultivation and the increase of population the animal requirements for timber and fuel increased while quickly multiplying herds of cattle roam far and wide over the remaining forests. Famine has always come and will then extend in the forest compared with greater rapidity than ever before on account of the increased demand for timber used in construction and firewood and partly on account of the fresh impetus given to cultivation on both sides of the line. I have watched this last process and I can testify from personal experience how fatal railway extension is to forests which are not subject to proper control and protection.

For some time the matter was considered in India but when the work commenced in earnest it was experienced in meeting the demands of timber for public works. Supplies had to be imported from foreign countries and it was then recognized that a great mistake had been made in allowing the forests to be so much destroyed. Experience had definitely proved that the preservation and suitable management of a sufficient area as forests could be left to private enterprise and that the interference of the State had become a necessity in the general interest of the country.

The forest question commenced to attract attention in the early part of this century in consequence of which a timber agency was established on the west coast of the Peninsula.

Next we find in the year 1843 Mr Conolly collector of Malabar planting teak on a large scale at Nilambur Dr Gibson was appointed conservator of forests in Bombay in 1847.

In 1848 Captain Frederick Chalmers Cotton caused the appointment of Lieutenant James Michael now Major-General J Michael C S I as forest officer in the Andamans, which post he retained for seven years Dr H Cleghorn became connected with forest conservancy in Mysore in 1847 and he was appointed Conservator of Forests in Madras in 1856 He was on special duty with the Government of India about the years 1860-62 when he inquired into the forest matters in the north western Himalayas and elsewhere In the Central Provinces Colonel Pearson was the first Conservator who took up forestry in a business-like manner

These gentlemen and others were the pioneers of forest conservancy in India Their action though unofficial caused the matter to be discussed and kept before the public and it led ultimately to the organization of a general department by Dr D Brandis now Sir Dietrich Brandis K C I E The latter was appointed superintendent of Forests in Pegu in 1856 by that great administrator Lord Dalhousie Dr Brandis was principal instrumental in saving the Burma teak forests from destruction by enterprising timber merchants (Natives) to whom estates which yielded now a gross revenue of some £2,000,000 a year In 1862 he was attached to the Government of India and in 1864 he assumed the first Inspectorship of Forests to that Government He then set to work to establish the Indian Forest Department and to introduce a systematic management of the forests At first he devoted himself to the Provinces not under the government of India subsequently he was twice deputed to Bombay and he totally reorganized the Forest Department in Madras in 1882-83 immediately before his final retirement from India

The first duty of the new department was to ascertain the extent and character of the remaining forests and especially of that portion which still belonged to the Government This inquiry was not of special difficulty except in so far as a sufficiently trained staff was not available at the outset

The next step was to take the State forests under protection and management and now difficulties arose There were no doubt some administrative officers who soon perceived that it was to the true interest of the people to preserve a sufficient forest area and who cordially assisted the new department but the majority of the officers of the State failed for a long time to accept the new principles because the idea of forest preservation was new to them and they feared complaints from the facts that the rights of government in the forests were in many cases undefined and that the people claimed extensive rights by prescription and on other grounds in the areas which were the property of the State

The first Indian Forest Law was passed in 1865 It provided that the Government might declare any land belonging to it a Government State forest and that such declaration should not abridge any right held by private persons over such areas but the Act failed to provide power to inquire into and legally settle the rights of third persons in the State forests Under the Act some forest progress was made in the preservation of the forests wherever the population was limited and the forest areas extensive

But where the reverse conditions prevailed and where the rights claimed by the people rightly or wrongly were extensive the benefits of the Act soon threatened to become abortive Consequently fresh legislation was soon contemplated and after years of discussion a new Act was passed known as the Indian

Forest Act of 1878 followed by special Acts for Burma, Madras and one or two other Provinces. Of these the Burma Act is the best. Generally speaking the enactments give power to the Government :—

(1) To declare any area belonging to the State, or over which the State has rights, to be a State forest.

(2) To demarcate such area, and to enquire into and settle, once for all, the rights claimed by third persons in or over such area, to commute such rights if they seriously interfere with the maintenance of such forests, and to prevent the springing up of new rights except by a Government grant.

(3) To provide for the proper protection and management of the State forests.

(4) To provide for the protection and management of Government forests not included in the reserved State forests.

(5) To provide for the preservation of private forests which are of special importance to the community as a whole.

(6) To provide for the protection of forest produce in transit.

(7) To provide for the adequate punishment of persons breaking the forest law.

Passing over many other provisions I shall only add that the Act is throughout permissive, that is to say the Government may bring its provisions into operation or not, as may be required from time to time.

Under these laws an area of about 55,000,000 acres, which is just under 10 per cent. of the British territory has been brought under the control of the Indian Forest Department, thirty-three million acres are so-called reserved State forests (that is to say, areas which have been set aside and are managed as permanent forest estates), while the remaining twenty-two million acres are as yet so-called protected or unclassed State forests, enjoying a limited extent of protection until it has been finally decided whether they are to be incorporated with the permanent State forests or not. Some fifteen million acres of additional forest lands are at the disposal of Government, which have not as yet been brought under the control of the Department.

It will be noticed that the area of State forests falls considerably short of 20 per cent. of the total area, the proportion which is believed to be that required to meet the demands of the country. There are however as yet extensive forest lands in the hands of private persons, and although their extent and yield capacity is decreasing every year a considerable portion is so situated, or of such a description, that it is not fit for permanent cultivation, and may be expected to yield always a certain amount of produce. Interference with these private forests will only be possible in cases of absolute necessity.

The bulk of the required produce must come from the State forests, and if they are to yield that, they must be managed in a careful and systematic manner.

Hence Sir Dietrich Brandis recognized at an early stage the paramount importance of providing a competent staff of officers. He obtained, as early as 1866, the sanction of Government to a scheme, under which every year a number of young Englishmen are selected, and trained in forest science and practice before they proceed to India to take their places as officers of the Forest Depart-

ment. For many years these young men studied forestry in Germany and in France. Gradually the idea that of studying in a foreign country and in a foreign atmosphere did not commend itself and it was decided to start in 1905 an English forest school in connection with the Royal Indian Engineering College at Cooper's Hill. Under these arrangements some 150 officers have been trained and drafted into the Indian Forest Department. At the present moment we have twenty two forest students under instruction at Cooper's Hill.

These young men are destined to recruit the superior or controlling staff of the Department. In addition it was found necessary to get the future executive officers (see Diagram) a suitable course of training. Accordingly an Indian forest school was started in 1878 at Dehra Dhun in the North Western Provinces which has been gradually developed so that it now turns out annually some thirty trained forest rangers. These are almost entirely natives of India; they enter the executive branch of the service but those of them who merit are eligible for promotion to the controlling staff.

The organization of the Department may be shortly described as follows. The Inspector General of Forests is the head of the Department and responsible to the Government of India. The Department in each Province is presided over by a Conservator of Forests (or sometimes in three in the large Provinces) who is responsible to the Local Government. He is assisted by deputy and assistant conservators each of whom controls the management of the forests in a district or part of a Province. Immediately under the controlling staff are the executive officers (forest officers grades) and they in their turn are assisted by the protecting staff consisting of foresters and guards numbering many thousands.

In this manner a working and efficient Department has been built up during the last quarter of a century which has under its charge as Imperial or Provincial property consisting at present of some 250,000 square miles of forest area. Some of these forests were taken over hard before they had been destroyed but by far the greater part of the area was taken over in a ruined and even ruined condition. Although a quarter of a century is but a short period in the life of a forest tree the effects of protection and systematic management are everywhere apparent. Extensive systems of communication have been constructed a large proportion of the forests successfully protected against the former's annually recurring fires, young growth with a view to spring up under the protection now afforded to it, and planting are carried out where required. The forests are managed under carefully considered working plans and are thrown open without interfering with the acknowledged rights of the people who receive every year enormous quantities of forest produce either free of charge or at comparatively low rates. In many parts of the country the people have come to recognize the importance to themselves of the proper preservation of a sufficient forest area and this feeling is steadily extending.

What I have said above refers to British territory. Space does not permit my dealing with forestry in native States beyond mentioning that of late years many native rulers have commenced forest conservancy in their States with the assistance and advice of officers of the Indian Forest Department on lines similar to those followed in the British territory.

And now the question may well be asked how about the cost of all this elaborate organization and the works of protection and improvement?

Well, on that hand too, I can present you with what I consider satisfactory figures. The net surplus of the Indian Forest Department, after meeting all expenses, has been as follows since 1864:—

NET REVENUE OF INDIAN STATE FORESTS.

1864–67,	average	annual	net	revenue..... £106,615
1867–72,	"	"	"	 183,929
1872–77,	"	"	"	 219,919
1877–82,	"	"	"	 248,792
1882–87,	"	"	"	 384,752

The annual net revenue during the period 1882-87 was nearly four times that of the period 1864-67, and although I am not in possession of the detailed figures for the years 1887-88 and 1888-89 I may state that the gross revenue realized in the latter year surpasses that for the period 1882-87 by about £300,000. Calculated for the whole area of the forests the revenue is as yet small, but there is little doubt, if any, that twenty-five years hence the net surplus will be four times the present amount, provided the Government of India perseveres in the forest policy as developed in the past. The growth of trees is of slow progress, and of all branches of the administration of a country the forest departments require to be more thoroughly guided than any other by the watch-word, "continuity of action."

BURMA

EXTRACTS FROM RULES RELATING TO RESERVED FORESTS.

1. Within a forest reserve no person shall poison water or set traps or snares, and no person shall hunt, shoot or fish without a license. Any person who in a reserved forest in contravention of this rule, hunts, shoots, fishes, poisons waters, or sets traps or snares is punishable under section 25 of the Act with fine, which may extend to Rs. 50, or when the damage resulting from his offence amounts to more than Rs. 25, to double the amount of such damage.

2. Such license may be granted by the deputy commissioner or forest officer in whose local jurisdiction such reserve is situated. Provided that no such license may allow hunting or shooting during the season when forest fires most commonly occur, namely from the 1st March to the 1st June, nor the hunting or shooting of pheasants, jungle fowl partridges, quails or hares, during the breeding season, namely: from the 1st March to the 1st September.

3. Such license to be in form provided, and a fee of Rs. 10 may be charged for the issue thereof.

4. Between the 5th day of January and the 15th day of June no person shall, within two miles of the boundary of a reserve leave any fire burning unless he shall have taken the following precautions, namely:—

(*a*) He shall at least one week before kindling such fire have given notice of his intention to do so to the nearest forest officer.

(*b*) He shall have cleared of inflammable matter a belt of ground of not less than twenty feet in breadth around the place whereon he proposes to kindle such fire.

(*c*) He shall have kindled such fire at a time when no high wind is blowing in the direction of the reserve.

Any person who, in contravention to this rule, leaves any fire burning in such manner as to endanger a reserved forest, is punishable under section 26 of the Act with imprisonment for a term which may extend to six months, or with a fine which may extend to Rs. 500, or with both, in addition to such compensation for damage done to the forest as the convicting court may direct to be paid.

NOTES ON FOREST MANAGEMENT IN GERMANY *

The following extracts are made from a work published by Sir Dietrich Brandis to illustrate the instruction given to forest officers at the Cooper's Hill College, Indian Forest Engineering College, and also with the object of forest Management in Western Germany. I might interest some other Indian Forest officers that are not to hear a lecture on the subject of forestry in the plains.

The character of modern forestry may be said to consist in this that each portion of the forest is treated with special regard to the peculiar conditions of the locality and the requirements of the growing stock, while the attention is constantly paid to the systematic arrangements of the entire forest range. The working plans prepared at the present time are elastic and they are rarely framed to adapt themselves to the circumstances of the case.

Baden Forest Administration. Division of the Württemberg Range

Block I (compartments 1–72). Aha 2053 hectares comprises the valley of the Aha stream as well as the northern slopes of the range which separates the Aha valley from the Seebachsee and the head waters of the Aha stream 550 to 1,000 m. Spruce is the prevailing tree with silver fir at lower elevations and beech near the top of the ridge. Scots mountain and Scotch pine in and near peat bogs at the head of the lake and in the head waters of the feeders.

Block II (compartments 1–61). A b 1,076 hectares occupies the south western aspect of the range mentioned under Block I above and opposite to St. Blasien, and a small area situated between the two branches of the Aha above their junction at 750 to 1,200 m. Spruce is the dominating tree with silver fir here and there constituting ½ of the growth of the growing stock. Beech more abundant near the top of the ridge. Scotch pine in a few places on steep and dry slope with a south western aspect (compartments 7 and 8). Very good natural reproduction on the pass situated between the two branches of the Aha river bearing the northern branch in compartments 60 and 64. Young pines of excellent growth mainly spruce with a little beech and silver fir 6,000 trees per hect. at 900 m mean elevation in compartment 28. Pure old forest through and composed of about spruce with 2 per cent silver fir 100 to 140 years old with 100 cub. m. per hect. in compartments 32 and 34 on opposite sides of the Aha valley leading to Menzenschwand. A tract near the southeast end of the block at a similar elevation part of compartments 7 and 8 stocked with spruce mixed with silver fir and beech 70 to 140 years old with 600 to 900 cub. m. per hect. A large extent the greater part of compartments 14 15 21 26 with pure stock of the surrounding compartments nearly 100 hect. of mostly pure spruce 100 to 140 years old on the top of the ridge called Hotzenwald which overlooks St. Blasien between 1,100 m and 1,270 m. The forest compartments stocked the same, and with a dense covering of moss the climate very moist but the trees are short. The growth is slow and hence does not so much depend upon the ground as there might otherwise be 300 cub. m. per hect. The reason is the high elevation and severe climate. At a lower elevation the growing stock of the same age on such a favorable soil is much larger. According to old traditions the trees were here cut in forest when the snow was on the ground and thus agrees with the estimated quantity as high compared with those standing in other and lower compartments. On the top of this ridge the road of the

* Extracts from Brandis & Co. Pp. [illegible] and separate reports of French and Swiss forests.

spruce has often germinated and the young plant has sent its roots over the decaying stump into the ground. The stump has perished, and the tree stands now, as it were, upon stilts in the air supported by its roots.

Block 3 (compartments 1–4): Kutteranet Halde, 90 hect., a small detached block, occupying the lower slopes of the Alb Valley 2½ km. below St. Blasien at an elevation of 700 to 840 m., under the village of Hochenschwand. Spruce, silver fir and beech, with a little oak.

Block 4 (compartments 1–3): Schwarzathal, 616 hect., occupying the slopes on the right side of the Schwarza Valley below the village of Hochenschwand. Spruce, silver fir and beech, with a little oak in the lowest part. More than half of this area has been acquired within the last fifteen years, chiefly by the purchase of private forests and pastures which now are planted up with pine, spruce and larch.

Blocks 5 and 6 (compartments 1–6), 179 hect., are two small detached blocks, Blasiwald and Dreiselbach, lately purchased.

The total area as here stated, 4617 hect. for Wolfalochen and 3144 hect. for St. Blasien, refers, it must be understood, to 1887, and comprises some pieces included within forest limits since 1885.

Utilization of Forest Produce

With so large a forest area, the question naturally arises whether there is a sufficient demand for all the timber and wood annually produced. For charcoal there was formerly a very large local demand for the numerous iron and glass works which existed upon these hills. The names of places such as Althütte, Antglashütte reveal the former existence of this industry, which is now nearly extinct. The last considerable iron works belonged to the State and these were closed in 1863; some glass works existed until 1877. The competition of works elsewhere using mineral coal, and favorably situated near railways and rivers, was too powerful, and the struggle of these small establishments, situated far from rivers and railways in out of the way and difficult mountainous districts, against such powerful opposition was hopeless, though the abundant water power available and the cheap and plentiful supply of charcoal gave them important advantages. Quite lately I am informed, a prospect has arisen of selling large quantities of small wood for making charcoal which is wanted by large iron works in Switzerland. On the other hand, the construction of roads has greatly facilitated the export of forest produce. The road up the Wehra Valley to Todtmoos was built in 1848–49, and that from St. Blasien down the Alb Valley was completed in 1861, and it is now proposed to construct a road from the Schluchsee along the valley of the Schwarza to the Rhine which will greatly facilitate the export of timber from the forests in the basin of the Schluchsee and in the Aha Valley. St. Blasien and the the country around has long been connected with the Rhine Valley by an old carriage road, but it ascended the plateau with a rise of nearly 900 metres and then continued with numerous descents and ascents to Waldshut. For the export of timber roads along the valleys with an even and gentle gradient are indispensable. The construction of convenient main roads has been supplemented by a system of well designed cart roads throughout the forest, and thus it has become possible as a rule to get the timber from some of the forest sections. The construction of these forest roads commenced in 1861, and every year new ones are added in order to complete the system laid down in the programme.

It is a remarkable fact that in this part of the Schwarzwald water carriage has never been used for timber to any large extent. The elaborate and most skilful arrangements which were formerly used and are still in use to some extent to facilitate the floating of timber on the Enz, Nagold, Murg, Wolfach and Kinzig rivers in the northern Schwarzwald were unknown here. At first sight this seems difficult to understand. But the rivers of the southern Schwarzwald, particularly those here in question, the Alb and Wehra, have a much greater fall and their bed in places is more narrow, and more obstructed by rocks and stones than that of the northern streams, in which floating has been chiefly practised.

The following is a sketch of existing arrangements for the utilization of the produce of these forests. For felling the trees, fashioning the timber and bringing the logs to the roadside, where they are sold, contractors (accordanten) here, as in the other state forests of Baden, are employed by the district forest officers. In each range four or five of these contractors generally find employment throughout the year. They are men of long experience in the business picked, and to a great extent trained by the Oberförster himself. Each works according to circumstances, with from 8 to 15 timber cutters, the contractor being the foreman and working himself with the men with whom he shares the profits arising from their operations.

As previously explained, by far the most important produce of these forests consists in the timber of spruce and silver fir. The following remarks will be mainly limited to them. The mode of utilizing beech wood offers no peculiar feature.

The thinnings in young forests are generally made between June and August. The poles to be taken out are marked by the forest guard under the district forest officer's general direction. The forest guard is authorized to permit more experienced timber cutters to mark, under his supervision, the poles to be thinned out. It has not having been possible to carry out thinnings in young forests as extensively as would be desirable, for the poles cut are in many cases unsaleable. The spruce and silver fir forests of those portions of the Black Forest which adjoin the Rhine Valley and of the Vosges on the other side of that river supply poles for the hop gardens of Alsace and Baden at lower rates. The forests of St. Blasien therefore can in exceptional cases only enter into competition with them. The present depressed state of the hop market makes it unlikely that hop poles will be largely exported from these forests.

Mature timber is generally cut between April and the middle of June and during the remaining months of summer and autumn the logs are prepared and brought to the roadside. As already mentioned, winter felling was customary to a certain extent at least in old times, but in those days charcoal was the main article produced and the timber was at once cut up for the charcoal kilns into billets which were easily moved on sledges over the snow. At present when large timber is the chief article produced, winter transport is not feasible and during the last 60 years summer felling has become the general rule in these districts.

The first operation is to bark the trees. Of the spruce bark a considerable portion is sold for tanning, that of the silver fir is used as fuel. Timber of prime quality, whether spruce or silver fir, is left in logs as long as possible and for such timber the contractor is paid for at the rate of 2 mark per cub. metre. It is classified under five classes, the first and second comprising those logs which at 18 m. (59 ft.) from the butt end have a diameter of 30 cm. (12 in.)

and 22 c m (9 in respectively while logs of the third class are required to have a diameter of 17 c m at 16 m from the butt The rest known as Sagekloetze and Latteklootze is cut into convenient lengths generally 5 to 6 m and brought to the canal saw mills where it is converted into planks and battens For this mass of timber the contractor is paid 1 o mk per cub metre on delivery at the roadside

A certain portion of the timber chiefly of spruce is in these forests used for splitting At Herrnau a large village north west of St Blasien and other places in the vicinity there is a thriving industry in sieves tubs and other articles made of split wood The workmen brought up to this special branch of the trade make a careful distinction between logs which split readily and those not suitable for their work and the former fetch a much higher rate at the sales Thus in the Alb Valley forests of St Blasien from which the coopers of Herrnau draw their chief supplies the three best classes of logs when split for splitting realized in 1885 for 21 18 2 and 15 2 marks per cub metre respectively while ordinary logs fetched only 10 8 14 4 and 11 2 marks In 1880 the figures were 19 9 15 5 and 14 1 for logs split for splitting and 15 + 13 8 10 + for ordinary timber

The Oberforster of St Blasien regularly employs one of the men from Herrnau in order to mark the logs fit for splitting and the logs thus marked are sold separately I spent a day in the forest with this man in order to learn the characters upon which he relies The first condition is that the log must be regularly shaped and clean without knots and branches Secondly the fibre must not be much twisted and if twisted at all the twist must go from right to left On barked logs the twist is readily seen by the direction of the fibre traces on the surface of the wood It can also be recognized but less distinctly on the bark of standing trees

In order to drag the timber to the temporary depots at the roadside where the sales take place horses or trucks are employed when the ground is level or nearly so Down a slope however the timber is lowered by means of ropes The ropes used for this purpose are of the simplest description a stout rope 140 feet long a strong iron hook with a ring to which the rope is attached two shaken and a kind of pick screwed the woolen handle 4 to 4½ feet and the iron 18 inches long

On slopes large trees are always felled with top and branches down hill and the logs are sent down top end forward two men bearing the rope which is generally slung round a tree while four or five men all armed with picks work alongside the log lifting it over uneven places in the ground or other impediments, stopping it where the rope is slung over another tree lower down and generally directing its course It is a fine sight to witness the speed and precision with which this difficult work is accomplished Accidents very rarely happen

In the latter portion of summer and in autumn the timber intended for export is all carted down to the railway stations It chiefly goes westward to Switzerland, Alsace and France This manifests itself in the higher rates realized at sales in the Wehra than in the Alb Valley division of the St Blasien State forests range which have to be carted nearly the same distance before they reach a railway station In the Wehra forests first class logs in 1885 fetched 17 9 and in the Alb thal forests 10 8 mk per cub metre In 1880 the figures were were 19.4 and 15.9

Small branches, as well as the underground wood, are unsaleable. The collection of small branch wood is permitted, and where practicable, the condition is attached to the permission granted that what remains on the ground must be burnt.

Of the larger branches and of the poles obtained by thinnings small quantities have as already mentioned latterly been sold as lop poles. A new demand for small wood has fortunately arisen through the erection of paper stuff factories from wood, the first of which was built in 1874. There are four such factories now in the vicinity and to these it is due that much of the small-sized spruce timber for which is the only kind used by them at present can be disposed of.

The yield of minor forest produce in these districts is insignificant. Here as elsewhere in the Black Forest the spruce was formerly extensively tapped for resin and in Württemberg the collection of resin in a few places where the old trees formerly tapped are still standing is still carried out, but these will soon cease, as the old trees are being cleared away rapidly.

Regeneration of the Forest

In some cases, for instance where a large proportion of the trees formerly tapped for resin are on the ground, it is necessary to clear and plant, but as a rule the system followed is to rely upon nature to reproduce as much as possible, and thus necessitates the gradual cutting of the mature stock. It has already been stated that the mean age at which the timber in these forests is cut is 120 years. When the time arrives for commencing cuttings in a compartment which has attained that age, the first operation is to clear away all soft woods and useless broad-leaved and to cut out any inferior growth that may have sprung up and that may not be suitable to form part of the young forest intended to be produced. After this follow in succession a series of cuttings more or less heavy, the beginning being made with the removal of all oppressed, damaged and diseased trees. These successive cuttings are generally continued in these ranges during a period of from 30 to 40 years. Thus in 1878, when a preliminary cutting had already been made, compartment 61 of Block 2 in Württemberg was stocked with a forest of two-thirds spruce and one-third silver fir containing 500 cub. metres per hectare (11,452 cub. feet per acre). In 1884 the first heavy cutting removed 240 cub. metres per hectare (3,500 cub. feet per acre). Afterwards five successive cuttings were made, which removed 1,143 cub. metres per hectare (16,350 cub. feet per acre) in 1897. Meanwhile the ground has got well stocked with young growth, and the remaining old trees will probably be cleared away by 1906. This long period of regeneration is necessary because seeding years in the cold climate of these districts are scarce in the case of spruce and silver fir, every fourth or fifth year and in the case of beech once in 8 to 10 years. But there is another object besides, viz. the great increase in timber of the trees left standing in a more isolated position after each successive cutting. Hence the practice is to keep the most valuable trees to the last. In the case of the silver fir groups of younger trees or single trees are left standing after the series of cuttings has been completed; they form part of a new forest growing up and will be cut when the next rotation comes round, having then attained an age of 200 years or more.

Forest Ranges Forbach (I and II) and Herrenwies.

The three forest districts to which the present remarks specially relate are the following. Area and actual yield are for 1886 :—

	Productive forest area, in hectares.	Annual yield in cubic metres.		
		Sanctioned.	Actual, 1886.	
			Total.	Per hectare.
Forbach, I.	3,609	16,730	16,906	5 24
Forbach, II	4,977	23,000	29,257	5 88
Herrenwies	3,459	21,000	18,694	5 40

Of these Herrenwies, which is entirely State forest is situated on the head waters of the Raumunzach and occupies a portion of the range west of the Murg. Forbach I comprises the communal forests of Forbach Langenbach Gausbach and a few other villages, as well as the Heiligenwald (Saints' Forest) of 800 hectares (2,124 acres), which is the property of the Forbach parish church. In these forests the Oberforster has the management in his hands in the same manner as in State forests. In regard however to the disposal of the wood cut by him, the communal authorities, and the trustees of the church are at liberty to make their own arrangements. As a matter of fact they gladly avail themselves of the Oberforster's services in this part of the business also. From the proceeds of these communal forests roads school houses and other public buildings are built, and the income from these forests is sufficient to defray all other expenses of the municipalities so that the members of these communities not only enjoy immunity from all local rates and taxes but also pay no school fees for their children. Part of the firewood which forms the yield of these forests is distributed among the villagers, so that they have most of their fuel free. For timber and other wood they pay like other people, but the money yield of most of the communal forests in the range Forbach I is so considerable that a certain surplus is divided annually among the villagers. Thus the people of Gausbach and other villages have this year received a share of the surplus, amounting to 70 mk. (£3 10s.) each householder.

The study of this and other communal forests in the Grand Duchy of Baden and in many other parts of Germany, will be found most instructive for those who have to deal with forest matters in India, for there is no doubt that the success of the endeavours which of late years have properly been made to stimulate the development of local self government in the different Provinces of India will, to a great extent, depend upon the success which may attend the efforts to place the self government of towns and villages upon a stable footing, by organizing a good management of such landed property as these communities possess, or may hereafter be able to acquire.

The income derived from the Heiligenwald has of late years been allowed to accumulate, until the amount had become sufficient for the erection of a new church, which has been completed at a cost of 350,000 mk. (£17,500).

Forbach II consists of the forests belonging to an ancient corporation (Murg Schifferschaft). The State has of late years purchased a large portion, about

one half of the shares and since that time the management of these forests has been intrusted to a State forest officer

As already mentioned the prevailing trees are spruce and silver fir the latter being more abundant at low levels while the spruce predominates in the upper portion. Wych elm is associated at considerable but varying proportions, while in some places it forms a large portion of the growing stock. It is a great shelter tree. The Scotch pine is found in the granite region chiefly upon its steep rocky slopes with a southerly aspect. [illegible] and is the purest forest [illegible] A remarkable feature here is the presence of natural [illegible] Scotch pine over the latter forming a [illegible] underwood of [illegible]

Although these forests present great variety [illegible] on the whole [illegible] is magnificent

The trees often attain a height of from 60 to 65 metres the stems carry their girth well up to a great height and are as a rule regularly shaped. Seed years come frequently and the reproduction is generally very good. A marked difference however exists as regards exposure at comparatively low elevations between a pure [illegible] and a northern aspect the latter showing much better growth and more abundant reproduction. The snow does frequently damage some of the younger crops but the storms [illegible] to which the name of ravens [illegible] The rainfall in the mountain area of the forest on both sides of the Mary River is usually considerable. It is remarkable how little damage by [illegible] takes place. Slips are of frequent occurrence but upon the whole it is insignificant. At times the pressure of the [illegible] snow is so heavy that large trees are uprooted [illegible] and [illegible] There are at many points of extensive [illegible] importance and these [illegible] are [illegible] upon the [illegible] Avalanches from [illegible] to [illegible] which sweep [illegible] the [illegible] forms [illegible] age at the lower edge of the forest and a few oak trees are seen [illegible] [illegible] The hornbeam is found here and there associated with the [illegible] specimens of the sycamore are now and then met with. The [illegible] at [illegible] and on the top of the two chief [illegible] and [illegible] with [illegible] and on such places the birch is also common

Of shrubs there is a great variety. It may be said that the forest is everywhere [illegible] to the [illegible] for [illegible] vegetation. In [illegible] and [illegible] where there is not a sufficient [illegible] to [illegible] up the ground is [illegible] covered with [illegible] almost absent, and the wild raspberry is scarce

From time immemorial these forests have been treated on the [illegible] system of [illegible] and [illegible] with [illegible] to their [illegible] ranges. Hence the [illegible] character of the forest is extremely varied [illegible] of all ages standing on the ground together. Formerly the practice was to select the finest and most [illegible] trees for felling. In this respect a great change for the better has now taken place for the aim at present is to cut out all unsound and badly shaped trees first so as to leave more room for the young [illegible] with and the more valuable trees. A rational treatment of forest on the selection system cannot easily be brought under precise rules. The manager must consider the requirements of each [illegible] separately and this is being done at present in these forests.

In order to determine the annual yield of forests managed under the selection system it is necessary to measure the old timber over the entire area, and the work cannot be shortened by the examination of sample plots. Thus at the renewal of the working plan for the Schiffershaft forests in 1896 all large trees in them 15 c m (6 inches and upwards were measured on 85 per cent of the total area. This was accomplished in two working seasons by two examination divers an immense and most laborious piece of work comprising the dense undergrowth of young growth which in most places covers the ground under the old trees. The volume of the smaller trees was estimated and the total growing stock was thus determined at 1 412 266 cubic metres exceeding the normal growing stock by 242 688 cubic metres. The rotation for this forest range was fixed at 120 years and upon these data the annual yield was fixed at 12 000 cubic metres, or 4·1 cubic metres per hectare. The average growing stock was 482 cubic metres but in many compartments the volume of timber exceeds 700 cubic metres per hectare.*

In 1896 the sanctioned yield of the Schiffershaft forests was not fully worked up to whereas in Forach there was an excess of 2 200 cubic metres over the sanctioned yield caused partly by the timber cut for road making partly by some extraordinary requirements of the village of Forach.

In the Herrenwies range the plan is not to continue the system of selection forests but gradually to introduce the system of felling by compartments (Kahlschlag) and in some portions of this range considerable progress has been made in this respect. Large areas are now stocked with uniform thickets up to twenty years old while others are stocked with pure forests so that in place a regular graduation of ages has been brought about. This has been accomplished by the gradual removal of the old trees under the shelter of which the young growth had come up.

The rotation here as in the two other forest ranges has been fixed at 120 years and it is intended that the period assigned to the cutting out of the old timber and the regeneration of the forest is eventually to occupy thirty to forty years.

Considering the enormous area of the forests it is remarkable that all the timber in them can be sold. Underground wood however finds no purchaser anywhere in these forests and only in the vicinity of the villages will people undertake to root up the stumps on taking away the wood without payment. The removal of tops and branches is free throughout these forests. The bark at present at most is not sold but is removed free with the branch wood. The produce of thinnings formerly found a ready sale in the hop gardens of the Kinzig Valley but the cultivation of hops has of late years greatly diminished and much of the small wood would remain unsaleable if numerous factories of paper pulp had not about fifteen years ago been established in the Murg Valley. This has opened a new demand not only for poles but also for small trees. At present the paper pulp factories have a decided preference for spruce and pay more for clean stems without branch knots.

At Schönmünzach already mentioned as the first village of Wurtemberg territory is a large glass factory which works with gas made from wood and this factory consumes annually a very large quantity of small wood. It is not improbable that hereafter the inferior knots of wood produced in the fire protected forests of Forach which at present are unsaleable may be used for the pro-

* It would lead too far in these notes to discuss the question why the Murg Valley ranges have declined, notwithstanding as they do unusual facilities as regards soil for the growth of spruce and silver fir, have a smaller annual yield in material than the Black Forest and Swabian Ranges in the southern Schwarzwald.

carbon of gas from smelting and that this it may be possible to reverse the action and save in some parts of India. Indian forest officers would do well to visit the Schonmunzach glass works.

The income of large timber is greatly augmented by the high rate paid in the valley of the Murg and other streets and most of the timber from the Murg forest is now exported in the shape of boards and battens. Of the pine kinds of timber, spruce and silver fir command the same rates as Scotch pine generally fetches a somewhat higher figure.

Timber is cut during spring and summer. In forests like these with heavy snowfall over the ground great care is necessary and it is best as not to injure the trees by felling and snagging on the ground. In felling the timber much attention is paid to this as a further safeguard the saw cuts of the standing trees are applied before felling. The trees are then cut into the trees with hand saws and are paid at the rate of from 1s. 6d. to 2s. 6d. per tree. A skilful man can get out trees measuring from 2s. to 4s. 6d. a day. Formerly the custom prevailed to cut the branches of trees standing over a young growth in order to return to the ground what it had taken from the state. This practice however has of late years been abandoned because it was found that the lopping of branches made the trees unsound. Through the whole forest are narrow dragging paths some in their natural condition others levelled and kept up. The timber is brought to the edge of these dragging paths and there the sale takes place. The logs are dragged generally by horses with or without the help of a pair of wheels according to the gradient of the path.

A system of carting roads however is being steadily extended over the whole forest and the timber carts carry very heavy loads measuring up to ten or twelve cubic metres. Under the present practice the stems are brought out as long as possible provided they are sound. It is found that the proprietors of the saw mills pay higher rates when they can cut up the logs according to their particular requirements. Road men work on the dragging paths as already mentioned as well as for carting stones are generally employed and from spring to autumn the roads are full of large timber carts on which logs up to 30 m. in length, are carried down the valley.

Copper Beech Stems near Kippenheim in the Rhine Valley.

The contrast between the unbroken forest of the Schwarzwald interrupted only here and there by stretches of land not very productive and the rich plains of the Rhine valley bearing splendid crops with luxuriant meadows on low ground and extensive vineyards on the hillsides is strongly striking in the Rhine valley between Freiburg and Offenburg one of the most fertile portions of Baden. There is not much forest but what there is produces large quantities of most valuable materials. Here are situated the forest districts of Kappelrodeck and Ettenheim which comprise the state and communal forests situated in the circle district of Ettenheim. Kippenheim where the Oberförster resides is a large village situated at the foot of the hills which rise to the Schwarzwald. Like most of the other villages in this district it has forests both in the uplands and in the Rhine valley. The privilege of these communal forests as attached in the case of this and other villages in the vicinity is to cover all house purposes so that the inhabitants have to pay no such taxes and no school fees. The forests in the plains are of special interest and particularly those which belong to the Kippenheim forest district. They form a compact block six kilometers long and

one to two kilometers wide and are situated between the Rhine and the foot of the hills at an elevation of 170 meters. One hundred and forty nine hectares of this area belongs to the Government and is known under the name of Kaiserwald, the rest belongs to private owners in the vicinity. Of these the best stocked and most interesting is that belonging to the village of Grafenhausen, 148 hectares adjoining the Kaiserwald on the west side. Over the whole area of these forests the soil is not uniformly good. It always consists of a surface layer of loam with much vegetable mould resting upon a stratum of more heavy clay and under which there is a thick stratum of gravel. The thickness of the clay overlying the gravel varies. At the same time there are small differences in level, and these circumstances are observed to have a considerable influence on the distribution of the trees of which the forest is composed.

The whole of the forest is treated as coppice under standards. In low situations and in moister soils where soft woods prevail the rotation of the coppice is 25 years but most of the area is worked under a rotation of 30 years. The species of which these forests consist are ash, oak, common pedunculate alder, hornbeam, common maple and elm. Of second rate importance are birch, aspen, maple, wild cherry and willow. Over the greater part of the forest the ash prevails and its proportion is being steadily increased by planting. In suitable localities it is grown with the oak. In regard to the influence of the soil upon the distribution of the different kinds it may be said that where the gravel is dry and near the surface the hornbeam prevails in the underwood and the oak succeeds particularly well, while in such localities the ash is apt to become stag-headed at the age of sixty years. Such places also generally have a somewhat higher level. Where the gravel is moist the ash, the hazel and the elm prevail. Where the gravel is wet the oak is wanting while the alder, elm, and hazel abound. In such places and on low ground generally the rotation is only twenty-five years because this is sufficient for the preferred kinds which are readily coppiced and the alder, the elm and the hazel. In such places however the proportion of the ash is being steadily increased by planting and eventually the normal length of a thirty years rotation will probably be established.

Coppice and Field Crops in the Siegen District

The Sieg which flows into the Rhine below Bonn drains a large area of mountainous country rising to near 700 m (2300 feet) the rocks of which clay slate and grauwacke of the Devonian formation are remarkable on account of the numerous veins of excellent iron ore which they contain. The oak is the principal tree forming the coppice with standards, but it is usually mixed with hornbeam and such other kinds of the locality as are naturally found in the region. Of the whole area of 5 000 square miles (12 950 square kilometers) of the Siegen woods on the headwaters of the Lahn, a tributary of the Rhine, have a peculiar case of oak coppice previously known under the name designation of "hauberge". This area is situated in the circle of Siegen and the part which form part of the east district Siegerlandgebirge of Arnsberg belonging to the Province of Westphalia and in small parts belonging to the districts of Dillenburg and Wiesbaden. The following remarks relate chiefly to the circle of Siegen.

In the narrow valleys of this mountainous country are numerous factories, mines and iron works some of them of old standing formerly worked with water power now mostly with water power and steam surrounded by well watered meadows with very limited areas of fields and gardens. The hills are well wooded and already stated almost exclusively stocked with oak. In the

midst of the oak coppice on the slopes and ridges are numerous extensive beds with rye the pale green of which in early summer contrasts strangely with the dark green mass of the oak forest. These beds change their position from year to year so that the traveller who visits the same locality in two successive years finds the aspect of the landscape changed through the general character remains the same. The high forest which covers the tops and ridges belongs to the State or to large private proprietors but the vast areas of coppice which occupy the main portion of the tract of country is not belonging to the State or to private proprietors but to townships or village communities but to persons separately or commonly regarded as the remnants of the old Mark-genossenschaften which at the time of the late Sir Henry Maine were an interesting and living group of institutions but are now rapidly disappearing. A common proprietorship over a large tract of land is Mark-genossenschaft is shown in a very primitive and interesting form by the Forêt. The coppice is managed on a system of from 17 to 20 years. 18 years on an average are the area assigned to each year's felling is treated in this manner. Early in spring March April the young shoots have begun to put forth leaves as well as the male catkins and the female flowers of the oak coppice are out but the chief growth is proceeding from the bottom of the young shoots. At the same time the peasants interested in the wood are engaged in cutting off the lower branches. As soon as the season is sufficiently advanced for the bark to come off readily generally in May or June the trees are ready standing the operation being performed as follows. From a cut made round the tree the lower portion of the bark is taken off downwards while the upper portion is pressed upwards the upper end remaining attached to the tree. In the case of large trees axes are used and weak trees are bent towards each other to peel them. The naked trees remain standing till the oak is dry enough to remove the bark. Small cords are then placed upon the trees. In the case of trees which have sprung from seed or naturally planted the rule is strictly observed to ring them one to the county a circular cut going through the bark only. The bark then removed is sent to the tanneries and thus promotes the growth of coppice shoots from the stool.

The wood is cut as near the ground as possible the cut being smooth and sloping without splitting and without injuring the roots. The poles over 5 cm. (two inches) in diameter are cut up to two metres (six feet) in length by means of two cuts in cutting up wards. Seedlings whether natural or planted are not yet but for growing remain standing so they may not be damaged by burning and when the corn is cut.

The wood is placed on the ground between the stools with the butt end down hill and is removed as soon as possible without injuring the young shoots from the stools.

Immediately after the bark has been peeled and while the naked poles are still standing the ground between the stools is worked up with a hoe of peculiar shape the sharp edge indented and is turned up in sods which are gathered in heaps and when dry are burnt with the aid of the small branch wood.

The burning takes place between July and September. The ashes are then evenly spread over the ground with a shovel, and the rye is sown broadcast.

The seed is worked into the ground with the aid of a peculiar kind of light plough without wheels usually called harbarer drawn by cows or oxen which are muzzled so as to prevent their browsing upon the young shoots of the oak coppice. The crop is always clean without weeds. In August the harvest takes place and the corn is cut with the sickle so as not to injure the young coppice shoots of the oak.

System of Management: Its Origin

The management of the forest estates here described is entrusted to committees elected by the shareholders for a period of six years. Each committee consists of a chairman and nine members. The current business is conducted by the chairman alone, but certain matters, such as the appointment of the guard who is entrusted with the protection of the estate and by law and custom assigned to the full committee.

In order to maintain and increase the stocking material in all the regulated forests in which these estates [illegible] to assess annually about 2 m. cubic [illegible] with the axe in autumn or in spring before the [illegible] on the ground adjacent to the [illegible]. Where damage has been done by [illegible] away when it happens to have a [illegible] value. Where essential [illegible] are subjected to a [illegible] damage. Where [illegible] the area covered by [illegible] 2 to 3 years after [illegible] and in order to provide a statement of such yearly outlays [illegible] for each estate. The [illegible] of the [illegible] are [illegible] who are elected for a period of six years by the [illegible] of having associated with a board [illegible] for the management of these estates, but the [illegible] of that [illegible]. The board [illegible] the chief officers of forest districts who have the supervision of the management of these estates so far as regards professional matters. The board [illegible] assigns the areas to be annually [illegible] by each shareholder and [illegible] the estates that may be [illegible] to them. At present there is no forest other than [illegible] for the entire area. The board [illegible] the [illegible] of the treatment and [illegible] and generally [illegible] and personal questions [illegible] management of these estates. All these matters are [illegible] a special law based upon [illegible] and [illegible] of these estates. The law which is in force at the present time was passed by both houses of the Prussian Parliament in 1879.

The system under which these forests are managed is very [illegible]. The first document preserved regarding it is of 1665 and a [illegible] account exists of land from which it appears that [illegible] manufactures the system then was the same as at present. The [illegible] development of the system must be attributed to two circumstances, the requirements of the mining and iron making industry and the insufficiency of arable land in the district.

[illegible] the iron works in this district were worked with charcoal which the forests furnished and for this purpose coppice was the simplest and most convenient mode of treatment. The [illegible] of timber was [illegible] known except readily to utilized for charcoal. [illegible] and the iron works in this part of the country in former times were always owned by some of the [illegible] and in some cases these [illegible] may have even owned the forest and [illegible] the works. In any case the organization of the Harzberg [illegible] has developed in a manner similar to that of the mining [illegible]. At the same time the population though never dense as compared with the plain country nevertheless [illegible] provide enough for their maintenance how was there sufficient [illegible] for their cattle. In this manner the [illegible] arose to utilize the forest for the temporary [illegible] of corn after the [illegible] had been cut over. These temporary [illegible] furnished a large portion of the corn and straw which they required. In 1882 the total area of the [illegible] 64,3 hectares [illegible] 0 acres) with a population of [illegible] consisted of 74½ per

cent forest five sixth haubergs) 10 per cent meadows and 13 per cent fields. Of the fields an average area of 6·40 acres was devoted to the production of corn so that the addition of about 4,400 acres which at that time was the aggregate area of coppice annually cut over and cultivated with rye was an important addition to the corn producing area. Even then, however grain was imported largely and now, with a vastly increased population (77·74 in 1880) the importation of grain has largely increased. It is estimated that at present three fourths of the corn consumed in the district has to be imported hence the great importance of the system here described for increasing the corn producing area.

The custom of raising one or several crops of corn on forest land and of letting the forest grow up again after the harvest is an ancient custom in mountainous countries of all parts of Europe nor is it confined to Europe but is found in most other parts of the world. In India it is known as kumri in the south, as jhum in the east, as dahya in Central India as khil in the north west Himalaya, and as toungya in Burma. In Europe however the system has in so far developed that the wood which grows up after the harvest is not all destroyed to furnish ashes for the field crops, but is otherwise utilized.

As the Siegen country was gradually opened up by railways, coal was imported and the use of charcoal ceased. This diminished the value of the forest crop as far as the wood was concerned but simultaneously the tanning industry, which was important as long ago as the fifteenth century developed on a much larger scale and at present bark is the most valuable produce of these lands. At Freudenberg, Siegen and elsewhere in the circle, large tanneries exist which receive hides from all parts of the world and send away the leather prepared by them in all directions. The oak bark produced by these woods amounts to 85,000 cwt. a year.

Coppice and Field Crops in South Germany, Austria and France.

Coppice combined with corn crops likewise occupies extensive areas on the sandstone (Bunter sandstein) of the Odenwald the mountain range situated between the rivers Main and Neckar in the Grand Duchies of Hesse Darmstadt and Baden. Here this kind of coppice is known under the name hackwald. Further south in the valleys of the Kinzig and Renchen on the gneiss and granite of the Schwarzwald it is known as reutfeld and under the same name it is practised in Wurtemberg and some parts of Switzerland. Circumstances in some respects are similar to those existing in the Siegen district and on the Moselle. The arable land is limited and the forest area large. Hence the desire to utilize part of the forest land for the production of corn and straw whenever the ground has been cleared by cutting the coppice.

In upper Styria there existed formerly and probably now to some extent exists a similar management of forests chiefly consisting of alder birch aspen and willow. At the age of twenty five to forty the coppice was cut the larger wood used or sold while the branches were burnt one crop of rye and a second crop of oats being taken after which the forest was allowed to grow up again. Wessely in giving an account of this system in 1862 states that it is disappearing and that many of the areas formerly thus treated are gradually being converted into spruce forests.

The practice called schiffl which prevails in the mountainous tracts of the Eifel is only a variety of this system differing in this that small brushwood only and no regular forest grows up on the land after it has yielded a cereal crop. Near Gerolstein for instance the land on the plateau of the Eifel which is not under

the plough or kept as meadow land is either high forest or coppice or schaffel and which is allowed to remain fallow for twelve years between two crops of corn and during that period gets covered with a dense matting of grass and bushes of broom and juniper. It is here the place to mention the system of *ortage* which prevails in some mountainous districts of Belgium and France particularly in the Ardennes the continuation to the south of the Hohe Venn. "Ortage resembles the system here described except that the coppice is worked under a longer rotation, twenty-four years, and that what is considered worthless vegetation is more generally employed, that is the sods of turf are not burnt in heaps but made use of and branches are spread uniformly over the ground and are fired during calm weather with the necessary precautions against spreading of the fire. The system is well described in that excellent work of Lorentz "Traité théorique et pratique de culture des bois," 4th edition, 1860, p. 424.

It is also treated in Wagner's Elements of Sylviculture, English translation 1883, p. 125. Wagner remarks that the system resulting out in France (various foresters in Germany as well as in France have often considered the system of converting coppice with local crops as barbarous and indefensible. This however is not a correct view of the case. The system has certain positive advantages as far as the growth of the coppice is concerned. Moreover in many districts it somewhat adapts itself to the requirements of the population. With due care and with the aid of diligent sowing and planting the coppice can under this system be maintained in excellent condition. On the other hand where it is not carefully supervised the system is wasteful and unprofitable. As a matter of fact in some districts the altered circumstances of the people may perhaps even tend to lead to a gradual extinction of the system, whereas in other districts it will be maintained and will continue to contribute materially to the well being of the population.

High Forests and Field Crops

The raising of corn crops between two crops of high forest or as an operation preparatory to the formation of new forests on waste lands has been practised centuries ago in different parts of Europe. On the south western portion of the mountain range which separates Bavaria from Bohemia known as the "Bayrische Wald" a peculiar system of forest culture has existed since the fifteenth century. The forest whole culture chiefly consists of beech with a number of trees being left standing for seed. During the first two years rye, potatoes and oats are raised on the ground which has been fertilized by the ashes of the logs and branches. The young plantation fully and properly and the ground soon gets covered with dense young growth with partly overgrown patches of weeds. When cattle have been kept out of the young forest in large enough to cut and burnt after the lapse of twenty to forty years. Often however these areas which are mostly private property and are known under the name of "Birkenberge, Birken reuter," are indiscriminately opened to cattle.

In the large spruce forests on the mountains of upper Styria, during the first part of this century the old wasteful system of clear felling was in some instances introduced with cattle were admitted immediately after cutting no steps being taken to facilitate reproduction. When gradually the rapid development of the iron industry in those parts of Austria made wood for charcoal more valuable one of the first measures to accelerate the regeneration of these forests and thus to increase their productiveness, was to set out the clearances for cultivation and to sow the spruce seed with rye. The stems were used for timber or charcoal but tops branches and trees without value were burnt. This system I

forest existence in 1865 on the mountains west of Ipuck. A large extent well stocked forest has been raised in this manner

On the mountains of the Stenwall which have already been mentioned connection with beech and coppice a system of mixed high forest with the a retention of Scots pine has been in use from time immemorial. The results this system may be seen in the shape of extensive even-aged forests aggregating over 2,100 hectares (5,240 acres) of Scots pine, spruce, silver fir and beech, to 120 years old, with a mean maturity increment per hectare of 6 cubic metres or 85.7 cub. ft. per acre

General Remarks on the System of Heavy Thinnings

The system of heavy thinnings in high forests combined with the raising of natural seedlings to prepare and if need be a final underplanting of the mature stock of trees which make the main and the best part of the crop is the result of a gradual growth of more than one century. The system has been applied in a methodical manner and upon a large scale in the Ash and Beech in the Spessart about forty to fifty years ago. It is not necessary that the natural mixed forests of Scots pine and beech in the Steigerwald and Franconian forest and mountain range east and west of the Spessart have been the result of artificial (ground) of Scots pine by means of an underwood of beech. The pure high forest of the principle was applied about 1820 in the Spessart a long continuous extending of red sandstone situated east of the Wesser River. In these forests which were hardwood, with heavy prescriptive rights of standing at that time found that the only profitable of right hours to the matter of wood and with the view of securing immediate needs with at the same time the improvement value of the forests a new system of treatment was introduced. Constantin Scotch which at that time had the character of these forests under the supervision of the former kingdom of Han over. A period of rotation was fixed 100 to 120 years but as compartments which had attained that age had been gradually cut and removed and it became necessary to commence cutting in forests 70 to 80 years old. Fortunately there was a large area. In the areas taken in hand about three-fifths of the trees were cut the ground got covered with a dense growth of self-sown seedlings with a few stems of beech and Scots pine forty years later the rest of the trees left standing had again come and had formed a complete canopy. In this manner a portion of the crop was cut by way of preparation and what remained had more room to grow with through the greater space given to the trees the ground remaining covered with what may be termed the ground flora of the lower stems of the forest. Subsequently as the canopy of the old trees became more complete the undergrowth gradually went back and most of it died. The forest after it had attained the full age presumed by the term of rotation was then cut by means of successive fellings and renewed by self-sown seed in the usual manner

Of late years this system of heavy thinnings has been somewhat overdone in various localities and a great deal has been written upon the subject. It would lead too far at the present occasion to enter further into the matter

Treatment

The rotation in this forest is 120 years divided into six periods of twenty years each but it is part of the general system of treatment followed here to allow selected vigorous oak and Scotch pine trees to remain on the ground when a

pieces of forest [illegible] which had attained maturity and thus to produce larger timber than the ordinary rotation would yield. This method [illegible] of standing. In a portion of compartment [illegible] of the [illegible] there is a beech forest dating from about 1800 with a number of Scotch pines of that time or earlier which were allowed to remain standing when the original forest was cleared. The result is [illegible] and well grown Scotch pine [illegible] are [illegible] than the beech forest which surrounds them, proves the excellence of the arrangement. The old Scotch pine trees standing over the young growth of oak in [illegible] have already been mentioned [illegible] the experience [illegible] somewhat [illegible] the Scotch pine being rather aged [illegible] a matter of fact a portion of these old trees have already [illegible] to be removed. In compartment [illegible] which is at present [illegible] expected to be [illegible] after a period of regeneration of about fifteen years [illegible] oak and Scotch pine [illegible] the young growth consisting of oak and beech with groups of silver fir and maple planted [illegible] where [illegible] have been rooted up.

In the regeneration of these forests night frosts are one of the chief [illegible]. It may here be mentioned that the [illegible] the tract with [illegible] its climate which extends from the foot of the [illegible] range to the [illegible]. In the [illegible] valley near Darmstadt I am told that there is hardly a month in spring and summer when night frosts do not occur and I [illegible] that there is no connection between the frequency of night frosts and a comparatively dry climate. This circumstance has to some extent influenced the [illegible] of these forests. Species which are readily damaged by frost such as the beech and silver fir can be [illegible] over [illegible] and [illegible] the [illegible] by a certain amount of shelter. The combination of [illegible] the system of partial clearances with underwood and the method of [illegible] among the young forest are these measures [illegible] where a young forest growth is [illegible] exposed to damage by night frosts.

Great stress is [illegible] laid in this forest district upon the early cutting out of [illegible] of soft and inferior woods and of woods which have served their [illegible] in acting as nurses [illegible] valuable kinds. A considerable amount of pruning is also done [illegible] with the saw. Thinnings are commenced early and [illegible] are repeated once in ten years. The peculiar treatment of these forests which results in mixed forests consisting of different species necessitates much attention to these operations whereby the [illegible] of the more valuable kinds is [illegible] promoted. Fortunately the [illegible] of [illegible] as [illegible] the [illegible] the result of these operations. At times, however, [illegible] and these operations have then to be delayed.

PROVISIONS OF THE BADEN FOREST LAW ON THE SUBJECT OF PASTURE

32. In high forests pasture is only allowed where the young growth has attained the age of thirty five years in [illegible] and [illegible] of thirty years in [illegible] forests.

In coppice woods pasture is not permitted unless the young growth in hard wood is twenty five and in soft wood twelve years old. Where the forest is mixed the age of the dominating kind or in cases of doubt the age of the hard wood, decides the point.

33. Forest pasture can only take place between the months of May and October.

34 Before sunrise and after sunset, cattle are not allowed in the forests, exceptions may be made in those cases where, on account of the distance, the cattle must remain in the forest. In such cases, however, they must be kept during the night in sheds, or within a ring fence.

35 Unless proprietors of cattle have a right to use certain paths, the line of road to be used in going to the pasture grounds and watering places, is indicated by the forest officers.

36. Sheep and goats are not admitted into the forests. In special cases, exceptions may be made by the forest authorities, with the consent of the forest proprietor

37 Each head of horned cattle must be provided with a bell

38. Each village community is obliged to employ one or several herdsmen for their cattle, as may be necessary.

The members of a village community may not drive their cattle themselves into the forests, nor may they send them with a herdsman of their own, separate from the herd of the village. Where a right of pasture does not belong to a village but to an association of proprietors, they must entertain a common herdsman for their cattle. Single proprietors having rights of pasture entertain their own herdsmen.

FOREST DESTRUCTION—ITS CAUSES AND RESULTS*

Forests of United States.

In his book "The Earth as Modified by Human Action" Mr. George P. Marsh devotes considerable space to the effects upon the earth's surface and the conditions of human life which have followed the removal of forests both in Europe and America. Some of the more pertinent paragraphs are herewith appended:—

It is perhaps a misfortune to the American Union that the State Governments have so generally disposed of their original domain to private citizens.

Within the memory of almost every man of mature age timber was of so little value in the northernmost States that the owners of private wood lands submitted almost without complaint to what would be regarded elsewhere as very aggravated trespasses upon them. Persons in want of timber helped themselves to it wherever they could find it and a claim for damages for so insignificant a wrong as cutting down and carrying off a few pine or oak trees was regarded as a mean-spirited act in a proprietor. The habits formed at this period are not a legacy of the past and even now the notion of a common right of property in the woods still lingers if not as an opinion at least as a sentiment. Under such circumstances it has been difficult to protect forest property, whether it belonged to the State or to individuals. Property of this kind is subject to plunder as well as to frequent damage by fire.

It is evidently a matter of the utmost importance that the public and especially land owners be aroused to a sense of the dangers to which the indiscriminate clearing of the woods may expose not only future generations, but the very soil itself.

Some of the American States as well as the Governments of many European countries still retain the ownership of great tracts of primitive woodland. The State of New York, for example, has in its north eastern counties a vast extent of territory in which the lumberman has only here and there established his camp, and where the forest though interspersed with permanent settlements reminds of some of its finest pine groves and often ravaged by devastating fires still covers far the largest proportion of the surface. Through this territory the soil is generally poor and even the new clearings have, for the most part of harvest more, distinguishes them elsewhere. The value of the land for agricultural uses is therefore very small and few purchases are made for any other purpose than to strip the soil of its timber. It is desirable that some large and easily accessible region of American soil should remain, as far as possible in its primitive condition, at once a museum for the instruction of the student a garden for the recreation of the lover of nature and an asylum where indigenous tree and bush and plant that adorn the glade at dusk and dawn may flourish undisturbed and perpetuate their kind. In the enjoyment of such perfect protection as the laws of a people so free of restraint can afford them. The immediate loss to the public treasury from the adoption of this policy would be inconsiderable for these lands are not at high rates. The forest as one economically managed would without injury and even with benefit to its permanence and growth yield a regular income larger than the present value of the fee.

*March, The Earth as Modified by Human Action.

carried beyond the demands of a wise economy

to other cases in the same States "where the cutting down of the trees, which had prevented the rain from collecting into torrents and running off in sudden land floods, has given rise to ravines from seventy to eighty feet deep"

Similar results often follow in the north-eastern States from cutting the timber on the "pine plains" where the soil is usually of a sandy composition and loose texture.

Woodlands in European Countries.

In 1862, Rentzsch calculated the porportions of woodland in different European countries as follows:—

Norway	66.00 per cent.
Sweden	60.00 "
Russia	30.90 "
Germany	26.58 "
Belgium	18.52 "
France	16.79 "
Switzerland	15.00 "
Sardinia	12.29 "
Neapolitan States	9.43 "
Holland	7.10 "
Spain	5.52 "
Denmark	5.50 "
Great Britian	5.00 "
Portugal	4.40 "

In many places peat is generally employed as a domestic fuel hence, though Norway has long exported a considerable quantity of lumber and the iron and copper works of Sweden consume charcoal very largely the forests have not diminished rapidly enough to produce very sensible climatic or even economical evils.*

Forests of Great Britain

The proportion of forest is very small in Great Britain, where, on the one hand, a prodigious industrial activity requires a vast supply of ligneous material, but where, on the other, the abundance of coal, which furnishes a sufficiency of fuel, the facility of importation of timber from abroad, and the conditions of climate and surface combine to reduce the necessary quantity of woodland to its lowest expression.

With the exception of Russia, Denmark and parts of Germany no European countries can so well dispense with the forests in their capacity of conservative influences, as England and Ireland. Their insular position and latitude secure an abundance of atmospheric moisture, the general inclination of surface is not such as to expose it to special injury from torrents, and it is probable that the most important climatic action exercised by the forest in these portions of the British Empire is in its character of a mechanical screen against the effects of wind. The

*Railway ties, or sleepers, are largely exported from Norway to India, and sold at Calcutta at a lower price than timber of equal quality can be obtained from the native woods.

From 1861 to 1870, Norway exported annually, on the average, more than 60,000,000 cubic feet of lumber.

Since 1873 the quantity of the annual exportation of timber from Norway and Sweden has steadily increased, and in 1881 it was so large that it might well excite the grave anxiety of all friends of the primeval forest.

due proportion of woodland in England and Ireland is therefore a question not of geographical but almost purely of economical expediency to be decided by the comparative direct pecuniary return from forest growth, pasturage and plough land.

In England arboriculture, the planting and nursing of single trees has until comparatively recent times been better attended to than sylviculture, the sowing and training of the forest. But this latter branch of rural improvement now receives great attention from private individuals though not so far as I know from the National Government, except in the East Indian provinces, where the forestal department has assumed great importance. Many laws for the protection of the forest as a cover for game and for the preservation of timber were enacted in England before the 17th century. The Statutes 1 Henry VI. c. xv., xii Henry VI. c. v. and xxvii Henry VI. c. xix. which have sometimes been understood as designed to discourage the manufacture of iron were expressly framed to prevent the destruction of large and valuable trees, useful in civil engineering and naval architecture, by burning them for charcoal. The injury to the forests was accidental, not the purpose of the laws.

In Scotland where the country is for the most part broken and mountainous the general destruction of the forests was carried on with very serious evils, and it is in Scotland that many of the most extensive plantations have now been formed.

Forests of France.

The preservation of the woodlands was one of the [illegible] recommended to France by Sully in the time of Henry IV. and [illegible] was established, and the restriction of the forest [illegible] rapidly [illegible] two generations after it [illegible] the [illegible] or want of wood. [illegible] the extent of [illegible] was very great and the [illegible] its enactments were not so severe [illegible] that [illegible] upon [illegible] the necessity of [illegible] and [illegible] estimated the remaining forests of [illegible] (42,000,000 acres)

In 1801 there were [illegible] at the rate of 82,000 hectares (202,600 acres) per year.

In a country and a climate where [illegible] of the forest are so necessary as in France trees must [illegible] large surface and be grouped in large masses in order to [illegible] to the best advantage the functions assigned to them by nature. A large part of [illegible] and otherwise such in consideration that it [illegible] properly devoted to the growth of wood than to any agricultural use.

The conservative action of the woods in regard to [illegible] has been generally recognized by the people of France as a matter of prime importance, and the Government has made it a principle of the acts of a special system of legislation in the protection of existing forests and for the formation of new. The clearing of wood and [illegible] and [illegible] a price for its protection are regulated by a law bearing date June 18th 1859 and provision was made for promoting the restoration of private woods by an act also adopted on the 28th July 1860. By a later law appropriating [illegible] francs to be expended at the rate of [illegible] francs per year [illegible] the replanting of woods.

In 1865 the Legislative Assembly passed a bill amendatory of the law of 1860 providing among other things for securing the soil in exposed localities by grazing and by promoting the growth of grass and the formation of greensward over the surface.

In 1863, France imported lumber to the value of twenty five and a-half millions of dollars and exported to the amount of six and a half millions of dollars. The annual consumption of France was estimated in 1850 at 212,000,000 cubic feet for building and manufacturing and 1,588,000,000 for fire-wood and charcoal. The annual product of the forest soil of France does not exceed 707,000,000 cubic feet of wood fit for industrial use, and 1,300,000,000 cubic feet consumed as fuel. This estimate does not include the product of scattered trees on private grounds, but the consumption is estimated to exceed the production of the forests by the amount of about twenty millions of dollars.

The timber for building and manufacturing produced in France comes almost wholly from the forests of the State or of the communes.

Forests of Italy

According to statistics, Italy had 17·64 per cent of woodland in 1872, a proportion which, considering the character of climate and surface, the great amount of soil which is fit for no other purpose than the growth of trees, and the fact that much of the land classed as forest was then either very imperfectly wooded, or covered with groves badly administered and not in a state of progressive improvement, might advantageously be doubled.

Taking Italy as a whole we may say she is eminently fitted by climate, soil and superficial formation for the growth of a varied and luxuriant arboreal vegetation. In such a country the promotion of forestal industry was among the first duties of her people.

The denudation of the central and southern Appennines and of the Italian declivity of the western Alps began at a period of unknown antiquity, but it does not seem to have been carried to a very dangerous length until the foreign conquests and extended commerce of Rome created a greatly increased demand for wood for the construction of ships and for military material.

The eastern Alps, the western Appennines, and the maritime Alps retain their forests much later, but even here the want of wood and the injury to the plains and the navigation of the rivers by sediment brought down by the torrents led to legislation for the protection of the forests by the Republic of Venice at various periods between the fifteenth and nineteenth centuries,* by that of Genoa, as early at least as the seventeenth, and both these governments, as well as several others, passed laws requiring the proprietors of mountain land to replant the woods.

Although no country has produced more able writers on the value of the forest and the general consequences of its destruction than Italy, yet the specific geographical importance of the woods, except as a protection against inundations, has not been so clearly recognized in that country as in the States bordering it on the north and west. It must be remembered that the sciences of observation did not become knowledges of practical application till after the mischief was

*According to Hommel, the desolation of the Karst, the high plateau lying north of Trieste, one of the most parched and barren districts in Europe, was owing to the felling of its woods centuries ago to build the navies of Venice. "While the miserable peasant of the Karst sees nothing but bare rock swept and scoured by the raging Bora, the fury of this wind was once subdued by mighty fir which Venice recklessly cut down to build her fleets."—*Physische Geographie*, p. 32.

already mainly done and even forgotten in Apulia, while its evils were just beginning to be seriously felt in France when the causes of natural philosophy as a general study were first acknowledged in modern Europe. The former political condition of the Italian peninsula would have effectually prevented the adoption of a general system of forest economy, however clearly the importance of a wise administration of this great public interest might have been understood. The winds which controlled and regulated the flow of the river sources were very often in one jurisdiction the plains to be irrigated or to be inundated by floods and desolated by torrents in another.

Action under a single government can alone render practicable the establishment of such arrangements for the conservation and restoration of the forests and for the regulation of the flow of the waters as are necessary for the full development of the yet unexhausted resources of that fairest of lands and even for the maintenance of the present condition of its physical geography.

Forests of Germany.

Germany, including a considerable part of the Austrian Empire, from character of surface and climate and from the attention which has long been paid in all the German States to sylviculture and forestry, is in a far better condition in this respect than its more southern neighbors; and though in the Alpine Provinces of Bavaria and Austria the same impoverishment which marks the rural economy of the corresponding districts of Switzerland, Italy and France has produced effects hardly less disastrous as yet as a whole the German States must be considered as in this respect the model countries of Europe. Not only is the forest area in general maintained without diminution, but new woods are planted where they are specially needed, and thus in the slow growth of forest trees in those climates restores the direct pecuniary returns of woodlands to a minimum the governments wisely persevere in encouraging this industry. The exportation of sawn lumber from Trieste is large, and in fact the Turkish and Egyptian markets are in great part supplied from this source.

As an instance of the scarcity of fuel in some parts of Bavaria, where not long since wood abounded, the fact may be mentioned that the water of salt springs is in some instances conveyed to the distance of sixty miles in iron pipes, to reach a supply of fuel for boiling it down.

The Austrian Government has made energetic efforts for the propagation of forests in Tyrol and on the desolate wastes of the Karst. In 18[illegible] upwards of 4[illegible] trees had been planted on the Karst, and great quantities of seed sown. The results of this important experiment are said to be encouraging. [illegible] *Forêts* in the *Revue des Deux Mondes*. Later accounts state that the Government nurseries of the Karst supplied between 1869 and 1872 2[illegible] young forest trees for planting, and that of 7[illegible] ash trees planted in the Karst scarcely one failed to grow.*

Forests of Russia.

Russia, which we habitually consider as substantially a forest country, which has in fact a large proportion of wood and is beginning to suffer seriously for want of wood. [illegible] border-reserves. Instead of a vast territory with immense forests which we expect to meet, one sees only scattered groves thinned by the

* For information respecting the forests of Germany, as well as other European countries, see the very valuable *Manuel de la Forêt*, by [illegible], Paris, 1[illegible].

wood or by the axe of the *moujik*, grounds cut over and more or less recently cleared for cultivation. There is probably not a single district in Russia which has not to deplore the ravages of man or fire, these two great enemies of Muscovite civilization. This is so true that clear-sighted men already foresee a crisis which will become terrible unless the discovery of great deposits of some new combustible, as pit coal or anthracite, shall diminish its evils.

Hehnstein, who was long professionally employed as a forester in Russia, describes the consequences of the general war upon the woods in that country as most disastrous and as threatening ruin on a ruinous extent. The river Volga, the life artery of Russian internal commerce is drying up from this cause, and the great Muscovite plains are fast advancing to become such as that of Persia.

Economy of Woodlands.

The action of the forest, considered merely as a mechanical shelter to ground lying to the leeward of it, might seem to be an influence of too restricted a character to deserve much notice, but many facts concur to show that it is a most important element in local climate. Experience in fact has shown that mere rows of trees and even much lower protections are of essential service in defending vegetation against the action of the wind. Hardy processes, planting in Algeria, belts of trees at the distance of 100 metres from each other as a shelter, which experience has proved to be useful in France.

In the report of a committee appointed in 1839 to examine an article of the forest code of France, Arago observes: "If a curtain of forest on the coast of Normandy and of Brittany were destroyed, these two Provinces would become accessible to the winds from the west to the north by breezes of the sea. Hence a decrease of the cold of the winter. If a similar forest were to be created on the eastern border of France, the continental wind would prevail with greater strength, and the winters would become more severe. Thus the removal or the felling of wood would produce opposite effects in the two regions."

It is thought in Italy that the clearing of the Apennines has very materially affected the climate of the valley of the Po. It is asserted in *Le Alpi e gli Appennini d'Italia* that: "In consequence of the felling of the woods on the Apennines, the sirocco prevails greatly on the right bank of the Po in the Parmesan territory, and in a part of Lombardy; it injures the harvests and the vineyards and sometimes ruins the crops of the season."

According to the same authority the pinery of Port, near Ravenna—which is twenty miles long and is one of the oldest pine woods in Italy, having been replanted with resinous trees after it was unfortunately cut—has relieved the city from the currents to which it had become exposed and in a great degree restored its ancient climate.*

The usual retardation of spring so much complained of in Italy, France and Switzerland and the increased frequency of late frosts at that season appear to be ascribable to the admission of cold winds to the surface by the felling of the forests, which formerly both screened it as by a wall and communicated the

*"The following most attested instance of a great change of climate is probably to be referred to the influence of the forest as a shelter against cold winds. To supply the enormous navy demanded for Italian wars, encouragement on the exclusion of England from the trade of Naples, the furnaces of the kingdom of Naples were stimulated to great activity. The ordinary production of charcoal not sufficing to feed the furnaces and the forges, the woods were felled, the timber cut before years' time, and the whole mountain of the Forest was deranged. At Piastanetto there was such a devastation of the woods and consequently such an increased severity of climate, that masses of snow never ceased. An assembly at Firenze, the purpose, effected the restoration of the forest, and many fountains again rise in the beds of Piastanetto." Report by Count Alessandro Manzoni, in *Il Politecnico*, December, 1841, p. 644.

warmth of their soil to the air and earth to the leeward. Cantù states that since the cutting down of the woods of the Apennines the cold winds destroy or stunt the vegetation and that in consequence of "the usurpation of winter on the domain of spring the district of Maggio has lost its mulberries except the few which find on the sea of buildings a protection like that once furnished by the forests."

Influence of the Forest on the Flow of Springs

It is an almost universal belief that the protection afforded by the forest against the escape of moisture from the soil by vapor, heat flow and evaporation insures the permanence and regularity of natural springs not only within the limits of the wood but at some distance beyond its borders and thus contributes to the safety of an element essential to both vegetable and animal life. As the forests are destroyed the springs which flow from the woods and consequently the greater waters arising from them have lessened in number and in volume. This fact is so familiar throughout the American States and the British Provinces that there are few old residents of the interior of these districts who are not able to testify to its truth as a matter of personal observation.

The hills in the Atlantic States formerly abounded in springs and brooks, but in many parts of these States which were cleared a generation or two ago the hill pastures now suffer severely from drought and in dry seasons furnish to cattle neither grass nor water.

Almost every treatise on the economy of the forest adduces facts in support of the doctrine that the clearing of the woods tends to diminish the flow of springs and the humidity of the soil.

Marchand cites the following instances —

"Before the felling of the woods within the last few years in the valley of the Seine, the Combe-au-Moreau and the Petite Valley, the Seine furnished a regular and sufficient supply of water for the iron works of Conflans, which was almost unaffected by drought or by heavy rains. The Seine has now become a torrent every shower occasions a flood and after a few days of fine weather the current is so low that it has been necessary to change the water wheels because those of the old construction are no longer able to drive the machinery and at last to introduce a steam engine to prevent the stoppage of the works for want of water."

"The spring of Combefoulat in the commune of Soleate was well known as one of the best in the country. It was remarkably abundant and sufficient in the severest drought to supply all the fountains of the town. But as soon as considerable forests were felled in Combe-de-pre Martin and in the valley of Combefoulat the famous spring which rose below these woods has become a mere thread of water and has altogether failed in times of drought."

"The Wolf spring in the commune of Soulcy furnishes a remarkable example of the influence of the woods upon fountains. A few years ago this spring did not exist. At the place where it now rises a small thread of water was observed after very long rains, but the stream disappeared with the rain. The spot is in the middle of a very steep pasture inclining to the south. Eighty years ago the owner of the land preserving that young firs were shooting up in the upper part of it determined to let them grow and they soon formed a flourishing grove. As soon as they were well grown a fine spring appeared in place of the occasional rill and furnished abundant water in the longest droughts. For forty or fifty years this spring was considered the best in the Val du Doubs.

A few years since the grove was felled and the ground turned again to a pasture. The spring disappeared with the wood and is now as dry as it was ninety years ago."

Importance of Snow

The quantity of snow that falls on extensive forests far from the open country has seldom been ascertained by direct observation because there are few meteorological stations in or near the forest. According to Thompson the proportion of water which falls in snow in the northern States does not exceed one-fifth of the total precipitation, but the moisture derived from it is doubtless considerably increased by the atmospheric vapor absorbed by its condensed and frozen crystals on the surface. Though much snow is intercepted by the trees and the quantity on the ground in the woods is consequently less than in open and in the first part of the winter yet most of what reaches the ground at that season remains under the protection of the wood until melted, and as it occasionally receives new supplies the depth of snow in the forest in the latter half of winter is considerably greater than in the cleared lands. Measurements in a snowy region in New England in the month of February gave a mean of thirty-five inches in the open ground and forty-four inches in the woods; but the actual difference between the quantity of snow in the woods and that in the open ground in the latter part of winter is greater than the measurements would seem to indicate. In the woods the snow which remains constant is consolidated by a pressure, while in the open ground being blown off or thawed several times in the course of the winter it seldom becomes so much packed as in the woods except in the bottom of various other positions where it is sheltered both from wind and sun.

The water furnished by the melting snow in winter sinks until it meets a more or less impermeable or saturated stratum and then by unseen conduits slowly finds its way to the channels of springs or crevices of the ground in deeper beds which unite in rivers, and so all is conveyed to the larger streams and by them finally to the sea.

Importance of Summer Rains.

In countries like the United States and Canada, where rains are comparatively rare during the winter and abundant during the summer half of the year, common observation shows that the quantity of water furnished by deep wells and by natural springs depends as much upon the rains of summer as upon those of the rest of the year and consequently that a large portion of the rain of that season must find its way into strata too deep for the water to be wasted by evaporation.

According to observations at one hundred military stations in the United States the precipitation ranges from three and one-quarter inches at Fort Yuma in California to about seven times as much, or twenty-three inches, at Fort Pike, Louisiana, the mean for the entire territory not including Alaska being thirty-six inches. In the different sections of the Union it is as follows —

Northeastern States	41 inches.
New York	36 "
Middle States	40½
Ohio	40
Southern States	51 "
S. W. States and Indian Territories	14½
Western States and Indian Territories	30 "
Texas and New Mexico	24½ "
California	18½ "
Oregon and Washington Territory	50 "

The mountainous regions it appears do not receive the greatest amount of precipitation.

The average rainfall of the Southern States bordering on the Atlantic and the Gulf of Mexico exceeds the mean of the whole United States being no less than fifty-one inches while on the Pacific coast it ranges from thirty to fifty-six inches.

Increased Demand for Lumber.

With increasing population and the development of new industries come new drains upon the forests from the many articles which wood is the material. The vast extension of railroads of manufactures and the mechanic arts, the luxury of architecture and especially of the construction of dwellings and halls of legislation with the present century have greatly augmented the demand for wood and but for improvements in metallurgy and the working of iron which have rendered the substitution of that metal for wood in so many instances would have a most startling picture of the last remaining tree fit for those uses.

Let us take the supply of timber for railroads. According to Chevalier France had in 1862 [illegible] kilometres of railway in operation 7,000 in construction half of which is built with a double track. Adding turnouts and extra tracks at stations the number of ties required for a single track is stated at 1,200 to the kilometre or as I have computed for the entire net work of France 8,400,000. It is now stated to be 20,000 kilometres of track half way = 24,000 and 24,000 × 1,200 = 28,800,000. Gurney states in 1858 that 4,000,000 trees had been felled to furnish the ties for the French railroads and as the ties must be renewed about twice in a century and new railways have been constructed since 1863, we may probably double this number.

The United States had in operation on the first of January 1872 [illegible],000 miles of railroad, 70,000 kilometres of track. Allowing the same proportion as in France the United States railroads required 112,000,000 ties. The number of ties annually required for these railways was estimated at 20,000,000. The annual expenditure for timber bridges, repairs and cars was estimated at $40,000,000 and the locomotive fuel at the rate of 1,000 cords of wood per day at $50,000,000.

The walnut trees cut in Italy and France to furnish gunstocks to the American Army during the late civil war would alone have formed a considerable forest.

The consumption of wood for lucifer matches is enormous and thousands of acres in extents are purchased and felled solely to supply timber for this purpose. The United States Government tax at one cent per hundred produced $2,000,000 per year which shows a manufacture of 200,000,000 matches. Allowing nothing for waste there are about fifty matches to the cubic inch of wood or 50,000 to the cubic foot making in all upwards of 2,000,000 cubic feet, and as only straight grained wood free from knots can be used for this purpose, but less than three or four thousand square feet of prime pieces are required.

Add to all this the supply of wood for telegraph poles wooden pavements, wooden wall tapestry paper shoe pegs wooden nails and wood pulp and other recent applications which ingenuity has devised and we have an amount of consumption for entirely new purposes which is really appalling. Wooden hop and garden fences are very generally used in America, and some have estimated the consumption of wood for this purpose as not less than that for architectural uses.

Fully one half our vast population is lodged in wooden houses, and barns and country out-houses of all descriptions are almost universally of the same material.

The consumption of wood in the United States as fuel for domestic purposes, for charcoal for brick and lime kilns for breweries and distilleries, for steam boats, and many other uses, defies computation and is vastly greater than is employed in Europe for the same ends. For instance in rural Switzerland cold as is the winter climate the whole supply of wood for domestic fires dairies breweries, distilleries, brick and lime kilns fences, furniture tools, and even house building and small smitheries, exclusive of the small quantity derived from the trimmings of fruit trees, grape vines, and hedges and from decayed fences and buildings, does not exceed *two hundred and thirty cubic feet* or less than two cords a year, per household. The annual consumption of firewood by single families in France has been estimated at from two and a half to ten Paris cords of 134 cubic feet.

The report of the Commissioners on the Forests of Wisconsin 1867 allows three cords of wood to each person for household purposes. Taking families at an average of five persons, we have eight times the amount consumed by an equal number of persons in Switzerland for this and all other purposes to which this material is ordinarily applied. It has been estimated that in the cold climate of Sweden, 144 solid or 200,000 cubic feet of pine or fir are required per head of the population. The consumption in Norway is about the same.

Evergreen trees are thoughtlessly destroyed in immense numbers for the purpose of decoration and on festive occasions. Thrifty young groves of evergreen of considerable extent have been completely destroyed in this reckless way.

France employs 1,500,000 cubic feet of oak per year for brandy and wine casks which is about half her annual consumption of that material, and it is not a whit less significant fact that are ringing in Nuremberg the quantity of wood used in parts of Germany for small carvings and for children's toys is so large that the export of such objects from the town of Sonneberg alone amounted in 1858, to 60,000 centner, or three thousand tons weight.

In an article in the Revue des Eaux et Forets for November, 1868, it is stated that 200,000 dozens of drums for boys were manufactured per month in Paris, this is, equivalent to 28,800,000 per year, for which 56,000,000 drumsticks are required. The consumption of matches in France is given at 7,200,000,000.

Effects of Forest Fires

Only trees fit for industrial uses fall before the lumberman's axe but the fire destroys, almost indiscriminately every age and every species of tree. While, then, without fatal injury to the younger growths the native forest will bear several "cuttings over" in a generation—for the increasing value of lumber brings into use every four or five years a quality of timber which had been before rejected as unmarketable—a fire may render the declivity of a mountain unproductive for a century.

Aside from the destruction of the trees and the laying bare of the soil, and consequently the free admission of sun, rain and air to the ground, the fire of itself exerts an important influence on its texture and condition. It cracks and sometimes even pulverizes the rocks and stones upon and near the surface, it consumes a portion of the half decayed vegetable mould which

served to hold its mineral particles together, and to retain the water of precipitation, and thus loosens, pulverizes and dries the earth; it destroys reptiles, insects, and worms, with their eggs and the seeds of trees and of smaller plants; it supplies, in the ashes which it deposits on the surface, important elements for the growth of a new forest clothing as well as of the usual objects of agricultural industry; and by the changes thus produced it fits the ground for the reception of a vegetation different in character from that which had spontaneously covered it. These new conditions help to explain the natural succession of forest crops, so generally observed in all woods cleared by fire and then abandoned. There is no doubt, however, that other influences contribute to the same result, because effects more or less analogous follow when the trees are destroyed by other causes, as by high winds, by the woodman's axe, and even by natural decay. *

When the forest is left to itself the order of succession is constant, and its occasional inversion is always explicable by some human interference. It is curious that the trees which require most light are content with the poorest soils, and *vice versa*. The trees which first appear are also those which propagate themselves farthest to the north.

The birch, the larch, and the fir, bear a severer climate than the oak or the beech.

The difficulty of protecting the woods against accidental or incendiary fires is one of the most discouraging circumstances attending the preservation of natural and the plantation of artificial forests. In the spontaneous wood the spread of fire is somewhat retarded by the general humidity of the soil, and of the beds of leaves which cover it. But in long droughts the superficial layer of leaves and the dry fallen branches become as inflammable as tinder, and the fire spreads with fearful rapidity, until its further progress is arrested by want of material, or more rarely, by heavy rains, sometimes caused, as many meteorologists suppose, by the conflagration itself.

* Trees differ in their power of resisting the action of forest fires. Different woods vary greatly in their combustibility; and even when the bark is scarcely scorched, trees are, partly in consequence of physiological character, and partly from the greater or less depth at which their roots habitually lie below the surface, differently affected by running fires. The white pine, *Pinus Strobus*, as it is the most valuable, is also perhaps the most delicate tree of the American forest, while its congener, the northern pitch-pine, *Pinus Rigida*, is less injured by fire than any other tree of our country. Experienced lumbermen maintain that the growth of this pine was even accelerated by a fire brisk enough to destroy all other trees.

UNITED STATES CONSULAR REPORTS ON EUROPEAN FORESTRY

There is a great deal of useful information respecting European systems of forestry contained in a volume entitled "Forestry in Europe," published at Washington, Government Printing Office, 1887 from which the following extracts have been made —

COPY OF CIRCULAR.

DEPARTMENT OF STATE,
WASHINGTON, November 30, 1886.

To the Consular Officers of the United States

GENTLEMEN — *You are instructed to prepare a report covering the following questions on Forest Culture and Forest Preservation I would ask you to devote especial attention to the practical phases of the question, that your replies may serve as a basis for framing forestry legislation in this country where the subject is of great and increasing importance.*

1 Areas under forests, distinguishing where possible, between State and private areas.

2. Common forests, if any, and privileges of the population in them If pasture is permitted, how are the trees, etc., protected?

3. Organization and functions of government forest bureaus.

4 Revenues from government forests, cost of maintaining or managing forests, profits of forest cultivation

5 Forest planting and culture, methods, bounties, if any, schools, their organization and courses of study

6. Destruction of forests, causes and results.

7. Reclamation of sand dunes, or waste places by tree planting

8. Sources of lumber supply trade in lumber bounties on importation, if any, and customs duties.

9. Give the names of three reliable sellers of seeds and shoots in your district.

10 Transmit to the Department copies and translations of the forest laws of the district in which you reside. (The general laws should be forwarded by the Consul-General, the local laws, by the Consul.)

I am, Gentlemen,

Your Obedient Servant,

JAMES D PORTER,
Assistant Secretary

Weights, Measures and Currency

Cental	Equals	220 pounds.
Centner meter	"	221.5 pounds.
Florin	"	35 9 cents.
Franc	"	19 3 cents.
Hectare	"	2.471 acres.
Joch	"	1 42 acres.
Kilogram	"	2.2046 pounds.
Mark	"	23.8 cents.

AUSTRIA HUNGARY. REPORT OF CONSUL-GENERAL JUSSEN

Government Control.

The forest laws of Austria prescribe and control not only the culture of the forests belonging to the imperial domain, but also all woodlands which are the property of municipalities, private corporations or private individuals, and are based upon the theory of paternal government.

If the law as it stands is enforced not a tree can be cut nor a load of dry leaves gathered in a forest which is situated in Austria except in accordance with certain rules and restrictions and although there may be much in these laws which may serve for framing future forestry legislation in the United States, the greater portion of the enactment is in direct conflict with the American idea of home government and property rights.

The Austrian Empire is unusually rich in forest lands. There is no lack of dense woods in any of its Provinces except in Dalmatia and Istria and in the territory near Trieste, and the culture of forest lands may be called exemplary, especially in Bohemia, Moravia, Upper Austria, Silesia and Salzburg.

The yield of these vast forests, although it is said to be on the decline, still far exceeds the home demands, and large quantities are exported.

Areas Under Forests, Public and Private.

The latest statistics place the total area of the productive land of the Empire at 28,406,530 hectares; of these total numbers of hectares 9 227 061 20 hectares are forest lands, and these again are divided into imperial (State), municipal and private forests as follows:—Imperial forests, 952,089 96 hectares; municipal forests, 1,297,258 21 hectares. The private forests therefore, cover about 32 per cent. of the total area of the productive land of the Empire.

Common Forests and Privileges of the Population in Them.

As common forests of the Empire only the woodlands belonging to the several cities and villages can properly be denominated. The residents of these cities and villages undoubtedly enjoy certain privileges as to the use of these forests, by virtue of the local laws and regulations. I am not in a position, however, to have access to these local regulations, which undoubtedly differ in the different communities, but are one and all subject to the general law on forest culture and preservation hereinafter cited. This general law, if strictly enforced, furnishes the means of ample protection against any injury that may possibly threaten these common forests by the wasteful or careless exercise of any privilege granted by local enactment.

Organization and Functions of Government Forest Bureaus.

The cultivation and preservation of the forests of the Empire of Austria and the administration of the laws with reference thereto are entrusted to the Ministry of Agriculture. The right of appeal, however, in certain contested cases to the Ministry of the Interior is reserved.

Under the supervision of the Minister of Agriculture the several Provincial presidents *statthalters*, are authorized to execute the forest laws and regulations, and as next in authority to these *statthalters* the several district captains are empowered to enforce the laws in question, and to exercise a general authority, supervision and control over all the subordinate officers charged with the execution of the forest laws, and forest police regulations. This subordinate class of forestry officers is composed of two classes:—

1. The officers who have entered the service permanently, after passing the requisite examination, and are in the line of promotion, like officers of the regular army.

2. The volunteer officers who for the sake of pursuing their studies and adding practical experience to theoretical knowledge, accept the position in the forest service as an honorable distinction, but receive a salary in proportion to the extent of their field of action and responsibility.

This latter class, however, like the first, must have passed certain examinations, proving their qualifications before they can enter the service as such volunteers.

The professional and regular forest officers in the Empire are classified as follows:—

A. Forest Inspectors.

2. Chief forest counselors (called oberforesträthe).

5. Forest counselors (or foresträthe).

7. Chief forest commissaries (called oberforestcommissare).

B. Forest Technicists.

Forest inspection commissaries (called forsttechniker).

C. Forest Wards Belonging to the Category of Servants.

Forest wards, class I, salary per annum, 500 florins.

Forest wards, class II, salary per annum, 400 florins.

Forest wards, class III, salary per annum, 300 florins.

The forest inspectors are charged with the duty of superintending the execution of all forest laws, of examining the condition of the forest, fostering and furthering instructions in forest culture and acting as adjuncts to the Statthalter.

From early spring until late in the fall the forest inspector should visit and inspect the forests in his district and make a report of each inspecting tour to the Statthalter.

The Statthalter may also order the forest inspector to make special inspecting tours in addition to the regular tour.

The forest inspector is required to inspect the offices of the district captains with reference to forest affairs.

The instructions to forest inspectors contain sufficient points, elaborately presented to fill a moderate-sized pamphlet, and the gist of the whole matter is that the forest inspector acts as a paternal adviser and if need be as an imperative commander to all owners of forests in the empire, as well as a superintendent of imperial forests.

He controls and commands private owners as to the manner and order in which they should cut their timber, as to the necessity of replanting, the preventing of waste, the preservation of timber against floods, and as to the danger and injury threatening from insects as to the fitness and capacity of the subordinate forest inspectors and hunters and forest wards to be employed by these owners, in short, there is not a single act of ownership which the holder of the titled deeds of woodland could possibly exercise over his own domain which is not directly under the control, and which does not require the approval of the forest inspector.

In the light of these instructions it is not at all paradoxical to say that the owner of forest land in Austria must exercise extraordinary care not to be guilty of trespass upon his own lands. There can be no question however, that this paternal control has achieved most excellent practical results though it is said that the discipline of forest officials has been lax, and that the laws and instructions have not been enforced with uniform strictness. The forest technicists and forest wards are the subordinate officers of the forest instruments by which the duties above enumerated and imposed upon the forest inspectors are practically performed.

Forest Register (Waldkataster).

In pursuance of a decree of the Ministry of Agriculture, under date of July 3 1873 the respective forest officers are required to keep a forest register of each district, which specifies the number of acres covered by forest its condition, state of growth, etc.

In connection with this register maps are prepared and kept open for inspection at the offices of the district captains upon which the condition and extent of the several forests in the districts are shown.

At the close of each year a report about the progress of forest culture, etc., is to be made to the Ministry of Agriculture, which report is to be published in the *Landes Zeitung*.

The total number of forest officers of all grades public and private, employed in Austria, reaches the respectable figure of 31,826.

Revenues from Government Forests—Cost of Maintaining or Managing Forests—Profits of Forest Cultivation.

On the point of the profits of Government forests there are absolutely no statistics published in the Empire, so far as I have been able to ascertain, except those given in the budget under the head of forest revenues and expenditures. The last budget published places:—

The forest revenues, p. a. florins	3,951,650
The forest expenditures, p. a. florins	3,546,240
Profit of State forests.....	405,410

These net proceeds of an area of government forest and, containing 952,689·96 hectares, certainly seem very inconsiderable, but in order to estimate

the true value of these forests to the Empire, their influence upon the climate, the rainfalls, and the consequent benefit to agricultural land, as well as to the health of the population, should be taken into consideration.

A direct benefit also results to the population from the employment of numerous officers attending to the cultivation and preservation of these forests, all of whom are paid and supported by the profits derived from the culture.

It cannot be contended, therefore that the people are taxed in order to support a small army of forest officers, who are actually producers, earning more than they expend.

I find on an examination of the meagre statistics to which I have had access that the profits of forest land culture have materially increased during the last fifty years.

The Kataster Real Estate Register) shows that in Lower and Upper Austria the net profit per joch was estimated at 1 41 florins in the year 1830, while in the year 1880 this estimate rose to 2 62 florins per joch, an increase of almost 100 per cent., an incontrovertible proof that the forest laws of Austria, which were passed in 1852, have been of great practical benefit to forest culture.

This benefit is proven, not only by the increased net proceeds of a given area of forest lands, but also by the growth and greater extent of the area itself.

Forest Planting and Culture Methods.—Bounties if any. Schools, their Organization and Course of Study

The method of forest planting and culture prevailing in Austria are quite particularly prescribed in the forest laws. There are no bounties paid in the Empire for planting or replanting of forests.

Schools.

The schools for forest culture were transferred in 1878 from the Minister of Agriculture to the Minister for Culture and Education, but all organic order and appointments of professors are made by the Ministers of Culture and Education with the concurrence of the Minister of Agriculture.

While there are undoubtedly numerous provisions of the forest culture law which cannot be applied or enforced in the United States, the system inaugurated in Austria to fit and educate young men for the duty of enforcing this law seems beyond all question worthy of imitation to the fullest extent.

These Austrian schools for forest culture consist of:—

A. University (hochschule).

B. Middle or preparatory schools.

C. Elementary or lower schools.

The university (hochschule) is situate in Vienna, it was founded in October, 1875.

Its aim and purpose is the highest possible scientific education in land and forest culture. All expenditures are borne by the State. The semesters (terms) are limited to six—that is, complete instruction is not perfected under six semesters.

The Students.

The students are either ordinary or extraordinary hearers. The ordinary hearer must produce a testimonial as a graduate of a gymnasium (college) or high school (*oberealschule*)—a testimonial which would also admit the students to any university

Whoever does not possess the qualification of an ordinary hearer may be admitted as an extraordinary hearer if he is eighteen years old and has that degree of preparatory education which will enable him to understand the lectures.

Guests may be admitted to single lectures on notice of the the dean (rector). All hearers are subject to the discipline regulations of the university

Immatriculation, Tuition Fee, and Laboratorium Tax.

The immatriculation fee is five florins for all hearers. The ordinary hearers pay a tuition fee of twenty-five florins at the beginning of the semester term)

Extraordinary hearers pay 1 50 florins per week) for each lecture.

Ordinary hearers, if poor, may, as a reward for great diligence, be released from the payment of tuition fees if the college of professors so decides

The laboratorium tax is five florins for fifteen hours.

Certificates of Attendance.

The attendance at lectures is certified to at the end of each semester In case of non attendance, the fact is stated on the certificate. The certificates are to be delivered to the dean for examination

Examinations and Testimonials.

The examinations are public and conducted under the supervision of the dean (rector)

In deciding the degree of success in examinations, not only the written school examination, but also the labor in the laboratory and the authenticated studies in chambers are to be taken into consideration.

Every ordinary hearer has the right to be admitted to the state examination if he so desires.

Regular and full diplomas are only issued to ordinary hearers.

Extraordinary hearers can claim only a testimonial certifying to their attendance at lectures good conduct and general progress in their studies.

Terms of Examinations for Diplomas in Forest Culture.

First Group.

1. Physics with climatology
2. Chemistry
3. General and special botany.
4. Mineralogy and geology
5. Mathematics.

6. Geodesy
7. Mechanics.
8. Geometry
9. National economy

Second Group.

1. Forest culture.
2. Forest felling with forest technology
3. Forest preservation with forest zoology
4. Forest laws
5. Forest yield, regulation and management.
6. Forest statistics.
7. Forest engineering.

The examinations are both oral and in writing during which the use of and reference to, books and memoranda are not permitted.

Only ordinary hearers who have performed the three years' course in the university are admitted to examinations for diplomas.

If the student desires to enter the service of the State as a forest officer, he must subject himself to, and pass two State examinations, after he has obtained his university diploma.

The subjects of the first State examination are the following:—Physics, climatology, chemistry, botany, geology, higher mathematics, geodesy, and national economy

The second State examination embraces the subjects of culture, use and yield of forest lands, calculations on values of forests, forest machinery, and forest laws.

These State examinations are conducted orally and in public. The State issues diplomas to the successful candidates.

Middle or Preparatory Schools for Forest Culture.

Three of these preparatory schools have been established in the Empire, one at Eulenberg, another at Weisswasser, and the third at Lunberg.

The conditions of admission to the Eulenberg school are the following —

1. The applicant must be a graduate of a lower gymnasium (under gymnasium, or *unterrealschule*, preparatory college.)

2. He must have served with good success for two, or at the very least, one year, as the apprentice of a forest official

3. He must not be less than seventeen and not more than twenty-four years old.

4. Must be in perfect health and vaccinated.

5. Must furnish security as to means required for instruction, clothing and support.

6. Must pass a preliminary examination by the teachers of the school.

The scholars, whose numbers shall not exceed twenty to twenty five per annum, reside at the institute.

The branches taught embrace mathematics, field engineering, drawing, natural history, forest culture, forest laws, business coorrespondence, office routine business, and hunting.

The conditions of admission to the other two middle schools are of about the same character, and nearly the same branches are taught there, all calculated to fit the student for admission at the university at Vienna.

In all these schools excursions are made by the scholars under the guidance of the teachers, for the purpose of combining practical illustration with theoretical knowledge, in the branches of natural history, forest culture, preservation and valuation.

Examinations take place at the end of each semester (term).

Elementary (Niedere) Schools for Forest Culture.

The Ministry of Agriculture has established four of these lower schools, one in Tyrol, one in Styr, one in Galicia, and one in Aggsbach.

Course of Study Mathematics, geometrical exercises, field engineering, measuring of wood and timber cut and standing measuring of arth and excavations, writing, drawing natural history, geology, mineralogy, zoology game as distinguished from other animals.

Practical Works Felling timber—numbering measuring and piling same, planting and replanting forests, draining and irrigation, protection against insects and fires, charcoal making, sawing lumber and hunting

The scholars are also required to construe and explain the most important provisions of the forest laws and to commit them to memory

They are also taught the use, value etc of all building material viz, wood, lime, bricks stone, sand, etc., and are instructed in the building and clearing of forest roads, and the securing of the banks of forest streams, and repairing fissures in same, etc.

As teachers in these elementary schools experienced forest officers are detailed

The discipline in these schools as regards the conduct and studies of the scholars, as well in school as in chambers, is very strict.

No scholar is permitted to absent himself from the institution without leave the side arms and guns intrusted to the scholars for practise, must be cleaned in the presence of the teachers and delivered to their care, all tools used by them must be cared for in the same manner

If an offence against the regulations is repeated three times, dismissal follows.

Strict moral conduct is enforced, and the scholars are continually under the direct control and supervision of one of the teachers, who is also charged with the duty of visiting the scholars in their rooms.

All moneys belonging to the scholars must be deposited with the teachers, who supply the depositors with the amount actually needed from the deposit funds, and the parents are advised of this regulation.

The regulations of discipline are too voluminous to be cited here in full. They also differ somewhat in the different schools, but on the whole they are framed in a strict military spirit, which looks upon obedience to rules of conduct as a first requisite to a successful course of study

A young man who has graduated from an elementary to a middle forest school, and from that to the university, or high school of forest culture, who has obtained his diploma at the latter, and has also passed the two State examinations, may be said to be thoroughly fitted for his profession, and besides undoubtedly clean, healthy, robust, and thoroughly manly in a physical as well as in a moral sense.

Extracts from General Forest Law of Austria in Force since January 1, 1853.

Cultivation of Forests.

Sec. 1. Forests are distinguished as (*a*) State or Imperial forests under the control of the State authorities. (*b*) Common forests, belonging to the city and country communities. (*c*) Private forests, belonging either to private individuals, or to corporations, or to orders monasteries, benefices or prebends.

Sec. 2. No forest can be withdrawn from cultivation and used for other purposes except by consent. This consent can only be granted with reference to State forests by the proper authority, and if questions of strategy or military defence arise the concurrence of the Ministry of war is required.

With reference to common and private forests the consent of the district authorities is required, and all parties interested are to be heard on the application, and in case of conflict of interests the matter is to be submitted to the proper civil judge.

The arbitrary use of forests for other purposes is punished by a five of five florins per joch (1 joch equals 1.42 acres).

The area thus converted to improper use must be replanted within a certain time, to be fixed by experts. In case of default the fine is again imposed.

Sec. 3. Newly-cleared tracts of State or common forests must be replanted within five years. A longer time may be allowed for the replanting of private forests, according to circumstances, and in pursuance of the provisions of section 20.

Sec. 4. No forest should be devastated, that is, so treated that the cultivation is either jeopardized or made impossible. If the cultivation has only been jeopardized a fine will be imposed in accordance with section 2 and the replanting is to be enforced. If however cultivation has been impossible, a fine up to ten florins per joch will be imposed.

Sec. 5. A cultivation which exposes neighboring forests to injury from winds is prohibited. A strip of woods at least twenty Vienna klafter wide must be left, when such danger exists, along the margin of the neighboring woods until the same is in full growth. In the meantime this wind-cloak can only be thinned.

Sec. 6. On sandy soil and on steep mountain slopes the timber can only be cut in narrow strips or thinned out, and must be immediately replaced. The woods upon the summits of mountains must only be thinned.

Sec. 7. On the shores of large rivers or lakes, if the shores are not composed of rocks, and on the slopes of mountains where land slides are possible great care is to be exercised, and roots can only be dug if the fissure is immediately repaired.

Sec. 8. Violations of sections 5, 6 and 7, are punished with a fine of from 20 to 200 florins. Damage accruing to others to be paid by offender.

Sec. 9 Provides for cultivation of common forests and for limitation and official control of grazing and other privileges and uses

Sec. 10 Grazing is not permitted in young timber where it might injure the growth and no more cattle are to be driven into any woods than can find sufficient food within the area. Herdsmen must be employed and the cattle shall graze together, and not isolated as much as possible. The driving of cattle to the place of grazing to be done without regard to the preservation of the forest, if necessary a circuitous route is to be taken

Sec. 11 Bedding of dry leaves and moss must be gathered only with wooden rakes without scratching up the soil. In young timber no gathering of bedding is permitted

Sec. 12 From felled trees all the branches may be cut from standing trees selected for future cutting the lower two thirds of branches may be cut. The young shoots between the strong branches must be preserved. From trees which are not to be felled immediately the branches must be cut between the months of August and March excepting only during severe frost. No climbing vines are permitted.

Sec. 13 The gathering of bedding can only be permitted on the same ground every third year. Young shoots, may however be gathered with permission of owner

Sec. 14. Provides for regulating the exact time within which parties possessing the privilege may gather bedding. Time to be fixed by the owner

Sec. 15 Provides for the different marks on timber to be felled

Sect. 16 Where the preservation of young timber requires it the cutting and transporting of timber must take place in the fall or in winter during snow fall. Generally timber may be cut also in spring or summer but in such case it must be taken out of the woods before the next ensuing spring

From trees felled in the green leaf the bark is to be peeled at once, from those felled in the late fall the bark must be taken in strips before the next spring. The stumps must not be left too high. In felling trees, hewing and transporting timber, all injury to standing trees is to be avoided. The same rule obtains with reference to the gathering and transportation of bedding which must be removed out of the woods within three months.

Sec. 17 All products of the woods must be removed on the road designated by the owner. The time of removal as agreed between owner and purchaser of timber to be requested if not so requested owner may give fourteen days' notice and dispose of products if notice is not complied with

Sec. 18. Provides that forest officials (political authorities) shall decide all differences and disputes. Owners of forests who violate regulations to be fined for each offence from 20 to 200 florins.

Sec. 19 Provides that the State in case of necessity can take possession of forests for the purpose of protection against avalanches, land slides, etc. If claims for damages arise they are to be settled according to law.

Sec 20 Provides manner of proceeding for the purpose of taking such possession, examination of experts, etc.

Sec. 21. As a rule no partition of common forests can be made.

Sec 22 For the purpose of insuring the proper cultivation of forests all owners of forests of sufficient dimensions (which dimensions are prescribed by the authorities) are required to employ only such foresters as are considered qualified by the government.

Sec. 23. The political authorities are charged with the general superintendence of all forests in their respective districts.

Transportation of Forest Products.

Every land owner is required to permit forest products to be transported across his land if no other outlet is convenient, or if other transportation is too expensive.

The transportation must be conducted with proper care, and all damages accruing must be paid.

The political authorities decide whether such transportation across lands of third parties is necessary and also fix amount of damages, from which decision as to damages an appeal may be taken to the courts.

Sec. 25. Provides for jurisdiction with reference to transportation over public roads, etc.

Sec. 26. The transportation of wood by means of rafts and the building of booms require special permission by the authorities of the district. If the use of private waters is required proceedings must be had according to section 24.

Secs. 27 to 43. Refer to the regulation of rafting, marking of timber transported by rafts, use of rivers and other waters, public and private, for rafting, etc.

Forest Fires and Damages by Insects.

Sec. 44. The greatest care must be exercised in igniting fires or in using combustible materials in or near the forests. If dangers arise in consequence of neglect to use such care the offenders must pay all damages, and may according to circumstances, be either prosecuted under the general criminal code or fined from 5 to 40 florins, or imprisoned from one to eight days.

Sec. 45. Every person who finds a deserted and unextinguished fire in or on the edge of a forest is required to extinguish it if possible. If any person observes a forest fire he is held to give notice to the next inhabitants in the direction of the road which he travels. These parties so notified are required to give notice to the nearest local authorities and to the owner of the forest or to his forest officials.

Sec. 46. All surrounding villages can be required by the owner of the forest, or his forest officials, or by the local authorities to extinguish the fire. The posse must at once repair to the place of the fire with the necessary fire-extinguishing apparatus. The local authorities and the forest officials must accompany the posse.

Sec. 47. Unconditional obedience is to be paid to the superior officer commanding the posse. The other local officials must preserve order among the firemen and cause the execution of the orders. After the fire has been extinguished the place where it occurred is to be guarded from one to two days, or longer, if necessary and the necessary number of men must be furnished for this purpose.

Sec. 48. Local officers who neglect to perform their duty will be fined from 5 to 50 florins and all persons who refuse to obey their orders will be punished by a fine of from 5 to 15 florins or by imprisonment from 1 to 3 days.

Sec. 49. Damages to property of third parties, caused by extinguishing these fires, are to be paid by the parties for whose benefit the posse was called, unless this third party was protected against still greater loss by the efforts of the posse.

Sec. 50. The damages caused to forests by insects are to be closely watched. The owners of forests and their employees are required, in case they cannot succeed in preventing the spread of such damage to adjacent woods, or on their own grounds, to notify the political authorities at once or in default thereof to pay a fine of from 5 to 50 florins. Every person is authorized to give such notice.

Sec 51 The political authorities with the assistance of experts, must at once take the proper measures to prevent this damage by insects. All owners of forests whose woods may be in danger are bound to render assistance and to submit to the order of the authorities who are herewith authorized to enforce their orders.

The expense shall be borne by the owners of the forests in proportion to the dimensions of their respective tracts.

Forest Preservation Service.

Sec 52. Provides for the organization of forest guards to be attached to the forest administration service. These guards, whether employed by the State, by communities, or by private individuals to take the oath of office. (Form of oath general, with reference to performance of duties in preserving forests as law requires).

Sec. 53. These sworn guards to be regarded as public guards, with all rights guaranteed to public officers by law, and authorized to carry the usual arms. Every persons is required to obey their orders given in the line of their duties.

Sec. 54. The guards shall use their arms only in case of self-defence. To wear uniforms.

Sec. 55. The guards are authorized to order suspicious persons to leave the forests and to confiscate all tools used for gathering forest products if the parties carrying them in the forest cannot give a satisfactory explanation.

Sec. 56 Confiscation of forest products in possession of suspicious party in the forest.

Sec. 57 Offender who are strangers to the guards are to be arrested, offenders known to the guard are to be arrested only in case they attack or abuse him, or if they have no fixed home Persons arrested to be delivered at once to the competent authorities.

Sec. 58 In case the offender was caught in the act and took flight he may be pursued beyond the forest and the stolen product attached.

Miscellaneous.

Chapter five contains an enumeration of minor forests offences not hereinbefore particularly mentioned, and fixes the punishment.

These offences are Gathering of loose wood and twigs marking and barking of trees, using climbing irons, boring into trees, appropriating bark from felled timber, exposing the roots of trees, cutting or tearing off limbs or twigs or leaves, digging or cutting out young trees, grathering twigs for brooms, gathering tree juice of all sorts, gathering tree seeds or sponges or rotten wood or digging out roots, gathering bedding of all sorts, especially if gathered with hoes or iron rakes, taking away earth, clay, turf, stones, and other minerals, or cutting sod, or mowing grass and herbs.

This chapter also provides for proceedings and estimate for damages to forests by cattle. Chapter six provides for mode of procedure and proper tribunal to fix damages. Chapter seven provides for proceedings on appeal.

KINGDOM OF PRUSSIA, REPORT OF CONSUL WAMER OF COLOGNE.

Forest Area in the Prussian Monarchy

The total area of the Prussian Monarchy amounts to 35,479,536 hectares.* Of this amount 8,124,521 hectares are forests, being an equivalent of 28.33 per cent. of the total area. It may be stated that this estimate includes all land devoted to the culture of wood.

The apportionment of the forests is as follows —

(*a*) 29.4 per cent., equivalent to 2,374,039 hectares belong to the State.

(*b*) 11.9 per cent., equivalent to 983,727 hectares belong to the Communes.

(*c*) 1.5 per cent., equivalent to 122,759 hectares belong to institutions.

(*d*) 2.1 per cent., equivalent to 170,063 hectares belong to corporations.

(*e*) 55.1 per cent., equivalent to 4,473,933 hectares belong to private individuals.

Under the same heads the Rhenish Province and the district of Cologne have the following area respectively:—

Rhenish Province.	Hectares.	Cologne.	Hectares.
(a)	143,284	(a)	11,766
(b)	321,019	(b)	7,358
(c)	7,149	(c)	1,773
(d)	15,303	(d)	1,201
(e)	342,687	(e)	98,284

The forests of Prussia stretch from the Baltic coast over the mountains of the Sudeten, Hartz, Thuringia, Teutoburg, Meissner, Taunus, Rhön, and the slate mountains of the Lower Rhine.

According to a rough estimate, 4,043,800 hectares of forest area are level, 2,089,500 hectares are hilly, and 1,991,200 hectares are mountainous.

Government Supervision Over Communal Forests.

Although the Communes are left free to manage the Communal forests, the State government reserves for itself certain rights over the general administration in order to prevent any mismanagement or abuses. For instance, in Westphalia and the Rhineland, which embrace this consular district, the communities and public institutions are left free to administer their own forests, but at the same time the government gives certain instructions regarding the culture and utilization of the forests, which, the local authorities are bound to carry out without any alteration on their part not first consented to by the government. Whether it is considered best that the Commune should appoint the officials intrusted with the supervision of the forest is left to the discretion of the government. In leaving the election of the forest officials to the Communes, they are to elect

*Consul Wamer says:—Considering the vast amount of technical knowledge required to fully comprehend the whole system of forest culture in Prussia, I have found it extremely difficult in preparing a report on this subject, and I am greatly indebted to *Oberforstmeister* (head forest master) von Wurmb, chief of the forest department of the Government district of Cologne for such information.

One hectare is equivalent to 2.471 acres.

The total area of forest in the Empire of Germany is 13,900,611 hectares, or 25 per cent. of the total land area.

such persons whose qualifications are approved by the government, to whom the election is submitted for consideration and confirmation. It is the duty of the government, either by virtue of its office or for some special reason, to examine into any changes made in the management of the Communal forest, and to proceed against all adverse administration by assuming special supervision or by instituting any other judicious precaution.

As technical organs for the supervision of the Communal forests, the government can make use of its foresters, who are generally bound to report to government any wrong done to the Communal forests that may come to their knowledge. The technical supervision is conducted by its technical foresters, namely, by the *oberforstbeamte* (head forest officers), and *forstmeister* (forest master).

Each *forstmeister* has a special geographical district allotted to him who has not only to superintend the State forests, but also, at the request of the government department of the interior of which he is a technical member to examine the management of all the Communal forests situated within his particular district. The *oberforstbeamte* (head forest officer), has general supervision over the administration of all the Communal forests situated within the government district of which he is the head, and by whom all orders are issued. The privileges of the Communes in their forests consist in their having sole benefit of all the income or any other profit derived from the forests. The use of the pastures, as well as the straw and grazing is usually permitted to the consumers whenever such use is very necessary but is so far restricted that the condition and value of the forests and the maintenance of the pastures may not suffer thereby. The Communes are bound to bring all sand dunes and waste lands under forest cultivation as soon as it is shown it can be profitably done. On all sales of Communal forest area the permission of the Government must first be obtained.

Organization and Functions of Government Forest Bureaus.

The State forest administration is under the Ministry for Agriculture, Domain, and Forest. The chief direction of forest affairs is divided into four heads:—

1. The central direction. Forest Department in the Ministry for Agriculture, Domain, and Forests.

2. Local direction. Inspection and control by the district government under the Department of Taxes, Domain, and Forest.

3. District administration by the chief forester (*oberforster*), respectively the Bureau of Receipts and Disbursements.

4. Forest preservation and special superintendents over the management of the subordinate foresters (the so-called *forstschutzbeamten*).

The revision of all forest accounts is done at the so-called *Ober Rechnungskammer* (Head Bureau of Accounts) of the Ministerial Department. The entire organization is based upon the division of the State forests into so-called *oberforstereien* (forest districts). Every principal forest district is an independent administration, for whose administration a separate finance is kept, and the chief forester who is the responsible administrator of the finance submits all the accounts through the forest treasurer of his district to the Finance Department of the government, for auditing.

The duty of the *oberforster* (head forester) is to watch and take care of the preservation of his forest district and to make his administration useful in every

possible way. It is, therefore, the duty of the *oberforster* to possess the most exact knowledge of the working of the district confided to his care, and not to neglect visiting the forest daily, if possible.

The *oberforster* is an independent officer, and is alone responsible for the duties and salaries of his assistants.

The *oberforster*, on having passed the scientific examination required by the State, is appointed by the Minister of Agriculture, Domain, and Forest, and receives a definite salary, with the right of pension. His rank is that of a government assessor. The extent of each forest district varies. There are 679 forest districts in Prussia, and the average size of each district is 3,496 hectares.

The following table shows the area of State forests in the different Provinces, also the number and the average size of each *oberforsterei*:—

Province.	Forest area.	Oberforsterei.	Average size of oberforsterei.
	Hectares.	Number.	Hectares.
East Prussia	309,241	74	4,355
West Prussia	273,174	47	5,812
Brandenberg	369,510	72	5,132
Pomerania	170,619	42	4,062
Posen	163,029	28	5,787
Silesia	151,325	34	4,451
Saxony	168,450	55	3,061
Schleswig	30,111	16	1,882
Hanover	235,074	104	2,260
Westphalia	57,189	19	3,009
Hessen-Nassau	258,003	146	1,733
Rhine Province	148,284	43	3,412
Total	2,374,039	679	45,475

There is a treasurer for each *oberforsterei*. He is an independent officer and is alone responsible for the administration of his bureau. The government appoints him, and he is required to give bond for the faithful discharge of his duties.

The foresters under the supervision of the chief forester (*oberforster*), are of two classes, namely, those who protect and attend to the practical management of the forests, the so-called *forsters* foresters), and *waldwarter* (forest attendant), and the assistant foresters, the so-called *forsthulfsaufscher*. The immediate head of the chief forester is the district government, especially its department of finance, and whose organs for the administration and supervision of the forests and the finances are in the person of the *forstmeister* (forest master), and *oberforstmeister* (head forest master). The former has control over a certain number of the chief forests within the government district, and the latter over all in the government district.

The *Forstmeister* resides at the seat of the district government as a territorial member of it. He has to personally inspect every part of the district at least three times a year assist in carrying out the regulations of work and in assessing the trees in controlling and fixing the annual plans of culture and the felling of the forest subject to the superintendence of the *Oberforstmeister*. Further he has to examine all the work done in the forest and to personally inspect the books of the *Forstmeister* and the accounts of the treasurer check the forest cash account and the inventories and interest once in every five years all the forest boundaries of every forest district within his district and report on their condition. As a member of the district government he has to work out all business matters which directly concern the inspection district except in cases where the work is specially provided for. All reports of the *Oberforstmeister* to the government must be sent through the hands of the *Forstmeister*.

The *Forstmeisters* are appointed by His Majesty the Emperor and King on the proposal of the Minister for Agriculture Domains and Forest of the above-mentioned who have distinguished themselves by their superior technical education and business management of forests. They have not to pass any special examination for this purpose as has all the forest executive examinations originally passed and required by the government for *Oberforstmeisters*.

Forstmeisters rank as *Regierungs-rathe* government councillors. The number of *Forstmeisters* at present in Prussia is 42 which is on an average of at least 6 to 7 *Oberforstmeisters* chief forest districts to each *Forstmeister*. This estimate however does not include the mountain forests of Westphalia and the Rhinelands nor the 10 forest *Oberforstmeisters* under the supervision of the *Oberforstmeisters* who are the directors of the whole administration of the entire government district and as such are the superior officers of the *Forstmeister*.

Accordingly there is one *Oberforstmeister* for each government district who is by virtue of his office a member of its department. The *Oberforstmeister* is selected out of a number of the most capable *Forstmeisters* who is proposed by the Minister for Agriculture Domains and Forest with the sanction of the State Ministry and appointed by His Majesty the Emperor and King. The *Oberforstmeister* having the entire forest administration of the government district has to make annually in conjunction with the *Forstmeister* an inspection tour and to see that the management of the forest is properly carried out. He has under the direction of the government district president the appointment and arrangement of the pay of the forest police according to the general instructions issued by the Minister. He has further the regulating of the general business the preparing of the budget the superintendence and approval of the annual felling and cultivation plans the distribution of the means for the cultivation of the forests and the disposition of the funds set apart for the entire district.

The Ministry for Agriculture Domains and Forest contains in its department for forest the central control for the entire state forest administration consisting of an *Oberforstmeister* chief State Forester a ministerial director and four forest technical and clerical councillors whose departments of business are arranged according to the Provinces. The general regulations for the maintenance and utilization of the State property consisting in forests are fixed by the Minister who also takes care that they are properly executed.

REVENUES FROM GOVERNMENT FORESTS, COST OF MAINTAINING OR MANAGING FORESTS; PROFITS OF FOREST CULTIVATION.

The estimated revenue and expenditure of the State forests for the years 1886-87, according to official statement, are given as follows:

Gross receipts	M.	56,070.000
Ordinary expenses	M.	31,062,200
Surplus	M.	25,007,800
Extraordinary expenses		2,450,000
Net income	M.	22.557,800

FOREST SCHOOLS.

In Prussia there exist three kinds of forest schools.

(*a*) Two preparatory forest schools for *forster* and *forstschutzbeamte*. The pupils, from 12 to 17 years of age, receive at these schools an elementary education and practical instruction in forestry under the direction of a *forster*. These schools are intended to take the place of the apprenticeship of two or three years which the student, on the completion of his elementary education elsewhere, would otherwise be obliged to serve at an *oberforsterei* under the direction of the *oberforster*. The advantage of the former is that it combines the elementary education with practical forest instruction.

(*b*) Two forest academies, one at *Eberwalde* and the other at Minden, under the department of the Minister for Agriculture, Domain and Forest, and the immediate supervision of the *oberlandforstmeister* one of the chief state forest officials in the Forest Department of the Ministry. These academies are intended to give a scientific education and to fit students for the forest administration service, that is to say, for the higher forest career, from *oberforster* upward.

The term of study is two years and embraces the following branches

A. Fundamental Science

1. Physics, including meteorology and mechanics.
2. Chemistry, organic and inorganic.
3. Mineralogy
4. Geognosy and geology.
5. Botany.
   (*a*) General botany
   (*b*) Anatomy, physiology and pathology of plants.
   (*c*) Special forest botany.
   (*d*) Anatomical and miscropical demonstration.
6. Zoology
   (*a*) General zoology
   (*b*) Special zoology particularly with respect to the different kinds of forest animals and birds.

7 Mathematics.

(*a*, Repertory and practice in arithmetic, planimetry trigonometry and stereometry.

(*b*) Principles of analytical geometry

(*c*) Principles of high analyses.

8. General political economy particularly with respect to forest affairs

B. Branch Science.

1 History and literature of forest affairs.

2. Forest statics.

3. Forest planting.

4 Forest preservation.

5 Forest technology

6. Forest valuation, wood measuring, forest survey

7 Forest statistics.

8. Forest administration, particularly with respect to the organization of forest affairs in Prussia.

9. Forest administration.

10. Redemption of forest claims.

C. Adjunct Science.

1 Jurisprudence, Prussian civil and penal code.

2. Forest road construction.

3. Game law

As aids to study, these academies have extensive collections relating to forest and natural science, botanical gardens, seed collections, etc. Each academy is under the direction of an *oberforstmeister* The lectures are given by scientifically educated foresters and special professors. The student, before he is admitted to these academies, must produce a diploma showing that he has passed the course of studies required at a German gymnasium or at a Prussian technical school of the first class. He must be under 25 years of age have a good character and show that he possesses the necessary means for studying

Effects of Forest Destruction

The destruction of forests is caused mostly by parcelling off large forest estates which leads to a careless felling of the trees and little disposition to restore the loss. An eminent authority on forestry science Dr Otto von Hagen, in writing on this subject makes the following observations

"The forest is a trust handed down to us from past ages whose value consists not alone in the income derived from wood, but also in the importance which it exerts, through its influence on climate and rainfall on land culture. Its importance is not merely a question of the present day or of the present ownership, but is also a matter which concerns the future welfare of the people. This is a truism beyond contradiction, but nevertheless it is daily disregarded by those who are indolent and selfish

"When such evils reach the stage of common danger and this is in a great measure already the case it then becomes a duty to interfere by legislation. Neither the decrease of the wood production nor the difficulty at times to meet the demand for wood nor the rise in the price can confer upon the State the right to interfere with the freedom of private ownership or of private administration of forests but the right and duty would devolve upon the State in case that any injury is done to the welfare and existence of the inhabitants of a certain locality resulting from the destruction of the forest. How entire districts which flourished in the past have been reduced to poverty and want through forest destruction, has been seen in Prussia, where large tracts of lands have suffered under such calamities.

"By stripping the beeches of their forests in the seventeenth and eighteenth centuries the sea coasts have become exposed to sea waves and storms. Fields, once fertile have been transformed into waste sand dunes and whole villages whose agricultural people formerly prospered have ceased to exist.

"In the middle and eastern Provinces light and undulating soil has been covered by small or large sand hills and places where forests once stood and served to carry off stagnant moisture, have been turned into marshes. In the western mountainous Provinces the fertile forest soil, the waste product of thousands of years of the trees, has disappeared. It has been dried up by the sun and wind, and washed into the valleys by rain and snow water and left the mountains bare and unfertile whose soil is scarcely capable of supporting any vegetation save heath and broom-grass.

"The rich meadows in the valleys have vanished they have been again and again, after every rainstorm washed and torn by the water rushing from the mountain tops. The high moors which have been formed by the destruction of the forest emit at all times of the year vapors and fogs which kill vegetation far into the land. Thus the soil becomes directly impoverished and the climatic conditions change and become worse. Instances of the injurious effect upon the nature of the soil, caused by the destruction of the forests can be seen to a smaller or larger extent throughout Prussia."

A Brief Retrospect

Early in the fourteenth century in the more thickly populated sections of Switzerland the people appear to have been forced, through apprehension of a deficiency in their wood supply, to take some measures for the preservation of their forests. In the year 1314 Zurich forbade its foresters workers to "fell, cut or sell wood from the Sihl wald." In 1339 Schwyz issued a prohibition against charcoal burning and in 1408 Freiburg decreed that no wood should be cut in the environs of the city. In Entlebuch it was forbidden in 1471 "to draw wood from forests situated high up in the mountains" and in 1492 Berne called attention to the need of economy in the use of wood. Laws similar decrees became general but while serving to preserve forest areas they proved a hindrance to the progress of agricultural and vine growing interests. Zurich, for instance, as late forbade the establishment of any new vineyards and the prohibition was kept in force up to the beginning of the eighteenth century. At that period the dread of a deficiency of wood became so general that it was even forbidden to purvey or export any of it from one village to another. Contemporaneously with these prohibitions were issued others forbidding the pasturage of cattle, sheep and goats in the forests. The old law generally ran in some such homely vein as this: Whoever keeps a cow at home in summer is allowed to drive no more than he actually requires for his house keeping.

But spite of all those precautions and prohibitive measures the lack of combined action became painfully apparent. Moreover the individual owners were refractory resented interference and held on to their woodlands, so that, in fact to-day the comparatively small forest area belonging to the State is what has principally been acquired by direct purchase, by inheritance or by the suppression of monasteries, as in the Bernese Jura, in Thurgau and in Schaffhausen.

With the advent, however, of the eighteenth century, Swiss forestry took on, in an official sense at least, a more active existence.

In 1702 Zurich, always foremost in the work appointed a commission to devise a general forestry system. In 1825 Berne followed suit, and later Freiburg, Lucerne and Schwyz took action in the same direction. From this time on the several cantons managed their own forestry matters as they wished, and entirely independent of each other up to ten years ago, when the imperative needs of combined action having become apparent the matter was taken in hand by the federal authorities, whose attention had been called to the pressing demand for a legislative action to arrest the destruction of forests especially in the higher mountain regions. Accordingly on the 24th of March, 1876 a law was passed establishing federal control over the forests in all the mountain regions of Switzerland, embracing eight entire cantons, viz. Appenzell, Glarus, Grauebunden, Schwyz, Tessin, Unterwalden, Uri and Valais, and parts of seven others viz. Berne, 41.48 per cent., Freiburg 32.70 per cent. Lucerne 53.50 per cent. St. Gallen, 76.17 per cent., Waadt, 22.98 per cent. Zug — per cent., Zurich 6.56 per cent.

Zurich Forest System

As will be observed from the foregoing Zurich has always evinced an actual and especial interest in forestry matters and the result is that her forestry system at the present day is a model one and is so regarded throughout Switzerland. Her forestry law, which has been in operation in its present form for over a quarter of a century, is so complete in every detail as to form a report in itself and it is therefore translated and incorporated in full herewith.

1. Organization

1. Cantonal township and corporation forests shall be subject to the control of the government forestry system. Private forests come under the same provision in so far as the safety of the others or regard for a common danger renders necessary.

2. According to article 49 of the law pertaining to the organization of the government council, supreme control of the forestry system is vested in the direction of the interior. A yearly sum of 8,000 francs will be allowed it for the cost of management, and for the interests of forest culture as, for instance in the award of premiums for distinguished services establishment of a course of instruction for foresters etc.

3. The canton is divided into four forestry districts, the limits of which shall be fixed by the council.

4. The cantonal forestry board shall consist of one oberforest master and four district forest masters. The council is authorized to furnish an adjunct thereto. To said board is vested the duty of superintending all forestry affairs. The maintenance of the cantonal forest under control of the director of finance is also transferred to it, the duties of its members will be especially determined by official instructions from the council.

5. Only those who shall have passed a government examination, as prescribed by the council, and have been declared competent by the direction of the interior, shall be employed as forestry officials.

6. The overforest master, the district forest masters and the adjunct, shall be chosen by the council on the simple, though not binding, nomination of the direction of the interior.

The term of service of the over and district forest masters shall be for three years. The adjunct shall be chosen for a period to be fixed by the council. Retiring officers are eligible for re-election.

7. The overforest master receives a salary of 3,500 francs. When travelling on official business, his cash outlays will be reimbursed. The further sum of 1,000 francs is allowed for clerk and office expenses.

8. District forest masters receive an annual salary of 2,200 francs. While on official journeys on forest service, they receive a daily allowance of 10 francs, and while on official journeys, in the interest of cantonal forests, a daily allowance to be determined by the council.

9. The council shall fix the sum to be paid to the adjunct out of the appropriation provided in article 2.

10. The daily allowances, when involving cash outlays, shall be paid from the cantonal forestry fund, or from the appropriation provided in article 2, depending on whether they concern business connected with the cantonal or non-cantonal forests.

11. Forestry officials are required to give bonds in the amounts to be determined by the council.

12. Each corporation shall elect a board of overseers of not less than three members, for a period of three years, and shall give notice of such election to the directors of the interior.

13. The employment of foresters is obligatory upon (*a*) the canton for all forests directly or indirectly belonging to it, (*b*) all forest-owning townships, and (*c*) wood corporations. Townships and corporations are directed to appoint an overforester. Several townships or corporations may unite on one and the same person for this purpose. Forestry officials appointed by townships and corporations, are, at the same time, subordinate to the cantonal forestry officials in matters pertaining to cantonal forests.

14. Townships, corporations and private owners are to pay the salaries of forestry officers appointed by them. Where the forests of a township or corporation are so small that such salary does not amount to 100 francs then the township or corporation in question shall unite with one or several neighboring townships or corporations to appoint a forester in common. The proper method of procedure in such cases shall be determined by the direction of the interior.

15. Cantonal foresters shall be chosen by the direction of finance on the simple, though not binding, nomination of the overforest master. The choice of township and corporation overforesters and foresters is vested in the board of overseers, which may, for this purpose, be increased to six or eight members. The term of service for overforesters and foresters shall be three years. Elections shall always be held after the renewal of the board of overseers. Retiring members are eligible for re-election. This period of service takes effect in individual cases from the first election held after the promulgation of this law.

16. The providing of foresters for private forests is left to the owners. But, in case a forest district is adjacent, the owner may decide upon the appointment

of a forester and be present at the election at which the majority must submit and assume its proportionate share of the salary. The proportionate amount to be paid as well as in paying shall be determined on a ratio of the area represented. Private individuals may with the consent of the township or corporation transfer to the district forester the care of their forests in which case they shall arrange with said township or corporation for what they are to pay.

17. Applicants for the position of overforester must furnish proof of their competency in the form of an essay to be submitted to the overforest master. Specific instruction as to the nature of said essay will be furnished in an order from the direction of the interior. As competency as a forester active citizenship, a good physical constitution and a knowledge of reading, writing and arithmetic will be required.

18. Elections of overforesters and foresters by boards of overseers of town and private corporations are subject to examination and confirmation by the direction of the interior. To this end certificates stating the manner of election, name, age and former employment of the candidate and the annual salary pertaining to the position shall be forwarded through the Statthalter's offices to the direction of the interior. The examination by the latter covers in part the validity of the election and in part the existence of the qualifications and it is ordered that confirmation be withheld where a candidate has previously been convicted of serious violations of or misdemeanors against forestry regulations. After confirmation the newly elected candidate is ordered to be sworn in; unless are no longer administered the hand now as it was used having been substituted which duty is to be performed by the Statthalter's other forestry officers appointing foresters must have them sworn in by the Statthalter's other.

19. Sworn forestry employees stand in regard to the performance of police duties on an equal footing with police employees. The same official credit is consequently to be accorded to their reports made under the provisions of article 16 as to the following articles of this law as would be accorded to the same if made by the police officers.

20. It shall be the duty of foresters in the cantonal t what paid corporation forests to attend a course of instruction on the subject of forestry to be provided by the direction of the interior and imparted by the forest masters. They may be required by the direction of the interior to attend a second course when a previous examination shall have proved unsatisfactory. They receive their service instructions from the direction of the interior. Foresters in private forests shall be allowed to participate in the courses of instruction referred to.

21. The consent of the direction of the interior is necessary whenever the overforest master, forest masters, foresters in cantonal forests desire to undertake other official position or business and other private occupation with their position as stated. Overforesters and foresters in cantonal paid corporation forests cannot at the same time be members of their election boards. Before entering upon any other township office or service they must procure the consent of the direction of the interior.

22. The following of any business in wood or manufactured wooden ware or of any industry in which wood is the leading material is absolutely prohibited for all persons in the cantonal forestry service.

FORESTRY IN FRANCE.*

The Woods and Forests of France.

In 1876, the last year for which anything like complete details are available, the total wooded area of France, exclusive of isolated trees, such as those growing in parks and on road-sides, which were not planted for the sake of the timber they produce, amounted to 35,464 square miles, or a little more than 17 per cent. of the entire area of the country. The proportion in other European countries is as follows, viz.

	Per cent.
Russia	40
Sweden	34
Norway	29½
Germany	26
Turkey	22
Switzerland	18
Greece	14
Spain, Belgium, and Holland, each	7
Portugal	5
The British Isles	4
Denmark	3½

The average of all European States taken together, is 29½ per cent. The population of France being 181 per square mile, it follows that the area area of woodland per head is about three-fifths of an acre.

Some changes, which will be noted in a subsequent chapter, have taken place in the area of the State forests since 1876, but in that year the woods and forests were owned in the following proportions by the different classes of proprietors, viz.—

	Square miles.	Per cent.
The State	3,734	10.7
Communes and sections of communes	7,949	22.4
Public institutions	124	0.3
Private proprietors	23,657	66.6
Total	35,464	100

and these figures may be taken as fairly representing the actual position at the present time.

Forests are not so exhausting to the soil as agricultural crops. In the case of the latter, the entire plant, except the roots, which are sometimes also taken, is removed, whereas with a crop of trees, the leaves, flowers and fruit, which are far richer in nutritive elements than the wood, are annually returned to the soil, and thus serve to maintain its productive power, as well as, by their protective action, to keep it in a good physical condition. Hence forests can flourish on comparatively poor soil, some kinds of trees, notably most of the conifers, being able to grow on ground that would be quite incapable of producing a series of

*By Major F. Bailey, R. E. Vol. XI. of the "Transactions of the Scottish Arboricultural Society."

remunerative agricultural crops, and it is therefore generally speaking out of place to keep rich fertile valleys under forests, which ought rather to be maintained on ground which cannot be profitably cultivated. In well populated districts, matters naturally tend to settle themselves in this manner, the better classes of ground being brought under the plough, while every acre of the rest of the country is kept wooded, in order to meet the domestic and agricultural wants of a dense population. But it is otherwise in less favored localities. Here vast areas might be devoted to the production of wood; but while, from the nature of the case, the local consumption is, in such places, very small, the absence of communications frequently renders export very difficult. Hence wood has but a very small value, and the forests tend to disappear gradually before the excessive grazing to which they are subjected. For the population of such regions, being unable to make its living by agriculture is, generally speaking, driven to adopt a pastoral life.

Forests grow in France at all altitudes up to about 9,000 to 9,500 feet above the sea, a much larger proportion of them being found at low than at high levels. Thus it has been calculated that, if the country were divided into altitude-zones of 200 meters each (656 feet), the lowest zone would contain 36 per cent. of the forests, while the highest would not contain more than 04 per cent of them; the fifth zone (2,600 to 3,300 feet) would, however, on account of the extensive plateaus existing at this level, contain more than the fourth. Forests situated at high altitudes do not produce so much wood, and are therefore, not so profitable as those grown lower down, consequently the private owners who have done their best to preserve their woods in the plains and low hills have, in the majority of cases, allowed the mountain forests they once possessed to be destroyed by over grazing. Hence it arises that, while at altitudes below 4,000 feet, the proportion of State and communal forests is comparatively small, hardly any private woods are found above the level of 6,000 feet, such forests as exist there being, generally speaking, maintained by the State or communes in the public interest, as a protection against avalanches and the formation of torrents. The private forests are then taken as a whole, more favorably situated than those which belong to the State and the communes both as regards soil, climate, means of export and proximity to the markets. It has been calculated that the distribution of the forest area by zones of altitude is thus proportioned:—

Altitude.					Forests under the forest dept.		Private and communal forests not under the forest department.	Total.
	M.	M.	Ft.	Ft.	State.	Communal.		
					Per cent.	Per cent.	Per cent.	Per cent.
Plains	0 to	200 =	0 to	656	41	5	45	36
Low hills	200 to	500 =	656 to	1,640	32	48	25	31
Mountains above	500 = above			1,640	27	47	30	33
					100	100	100	100

It is said that if the trees could be grouped together, so as to form a series of pure forest, the proportion of the total area which would be occupied by each species would be as follows:—

	Per cent.
Oak (Q. sessiliflora and Q. pedunculata)	29
Beech	19
Hornbeam	12
Silver fir	7
Scotch pine	4½
Evergreen oak (Q. ilex)	4
Maritime pine	3
Spruce	3
Larch	2
Other kinds	16½
Total	100

The small number of species which enters to any important extent into the composition of the French forests is very remarkable. Thus it appears that oak beech, and hornbeam occupy 60 per cent. of the tree covered area, more than one half of the remainder being taken up with six other species but many other kinds are disseminated throughout the forests in various proportions according to circumstances. As a matter of course, however, the trees are not grouped together in the above manner and, neglecting blanks, the crop on the ground is actually constituted somewhat as follows:—

	Per cent.	
Pure forests—		
Broad-leaved (oak or beech)	15	
Coniferous (silver fir, pine, spruce, or larch)	13	
		28
Mixed forests—		
Broad-leaved (oak, beech, and hornbeam)	52	
Broad-leaved and coniferous (beech and silver fir, or oak and pine)	18	
Coniferous (silver fir and spruce)	2	
		72
Total		100

Or separating the broad leaved and the coniferous forests from those which consist of a mixture of the two, we have:—

	Per cent.
Broad-leaved forests, pure and mixed	67
Coniferous forests, pure and mixed	15
Broad leaved and coniferous forest	18

The State forests show a smaller proportion of pure crops than are found in those of the communes, but they also comprise a very much larger proportion of forests in which the crop consists of a mixture of broad-leaved and coniferous species. The first of these differences is due to the circumstance that a mixture, which is always desirable from cultural considerations, has been systematically maintained in the State forests from a remote period, whereas this has not always been the case in the communes. The second difference is chiefly accounted for

by the fact that those parts of the State broad leaved forests where from various causes the soil has [illegible] have frequently been planted up with conifers [illegible] capacity to grow [illegible] cases, [illegible] to be raised under their shelter [illegible] The private forests [illegible] State property [illegible] classes of forests need not be made at present

Many [illegible] the nature of the [illegible] growth, which characterizes any particular locality

[illegible] Forty-four per cent [illegible] spruce [illegible] Scotch pine [illegible] evergreen oak [illegible] for example, [illegible] suit either *Quercus sessiliflora*, the beech or the evergreen oak

[illegible] they spring

[illegible] effect than the former in improving the soil

It is estimated that [illegible] square miles of woods and forests yielded the following produce in 1876, viz., 17,596,227 [illegible] cubic feet of wood of

all qualities 321,741 tons weight of tanning bark, 2,556 tons weight of cork, and 31,539 tons weight of resin, the whole being valued at £9,471,017. The average production of wood was therefore 59 cubic feet per acre, and the gross revenue, omitting that on minor produce which was very small, was equal to 8s. 4d. per acre.

But in addition to this, it is calculated that the isolated trees, not grown for the sake of their timber, and vines yield together three and one-half million loads per annum, valued at £1,000,000, so that the total production of wood in France is raised to about twenty one and one-half million loads, and the value of the wood, bark, and resin to about £10,500,000. This gives the amount of wood and the money value of the forest produce per head of the population as 2½ cubic feet, and 5s. 9d. respectively.

Of the twenty one and one-half million loads of wood produced, about four million loads were timber and the rest firewood. The latter sufficed for the national requirements, but the former was far from doing so, for the imports of wood of this class exceeded the exports by 2,062,432 loads, valued at £6,408,000—that is to say, that it was less than two-thirds of the amount required. The question of foreign timber supply is, therefore, a very important one, even for France, which has 17 per cent. of its area under forest.

FORESTS MANAGED BY THE STATE FOREST DEPARTMENT

The forest law of 1827, which is still in force, confirmed the previous legislation under which all woods and forests which form part of the domain of the State, all those which being the property of communes or sections, or of public institutions, are susceptible of being worked under a regular system, and finally all those in which the State, the communes, or public institutions possess a proprietary right jointly with private persons, are administered directly by the State Forest Department in accordance with the provisions of the forest law.

The areas thus administered at the commencement of 1885 were as follows, viz.,

	Hectares	Square miles
State forests	1,012,688	= 3,910
Communes, sections, and public institutions	1,967,846	= 7,598
Total	2,980,534	= 11,508

These figures, which include the dunes represent about 5½ per cent. of the entire area of France, and nearly one-third of the total wooded area. An additional 144 square miles of barren land had, up to the end of 1884, been purchased by the State in connection with the project for the consolidation of bare and unstable slopes on the great mountain ranges, and this area is also administered by the department under the forest law. About 40 per cent. of the State forests are situated in the plains, while the rest of them together with nearly the whole of the communal forests are found in about equal proportions on low hills, up to an altitude of 1,700 feet, and on the higher mountain ranges. About one half of them stand on limestone rock, 92 per cent. of their entire area being actually under wood.

The principal object of the following pages is to sketch in a brief and summary manner the system of management adopted for these forests so that some general idea may be formed of what the business of the French forest department consists in and what the results of their labors have been up to the latest date to which information is available under each head. The organization of the professional staff of the department and the manner in which it is recruited, will then be explained.

State Forests

The forests now belonging to the State owe their origin to one or the other of the following sources. By far the greater part of the ancient royal domain was constituted at the time of the Revolution of 1789 and the succession laws introduced in France soon after that year. Other forests were confiscated property confiscated at the time of the revolution in 1790 or 1793 have been more recently acquired by purchase legacy or gift. About one half of the more ancient royal domains.

The State forests were formerly of much greater extent than they are at present. In 1701 they covered an area of 18 126 square miles which was reduced to 4702 square miles in 1870 the reduction being almost solely due to sales effected for the benefit of the exchequer but the loss of territory after the war of 1870 was the cause of a diminution of 374 square miles. The records show that between 1814 and 1870 1,962 square miles of State forests were sold for nearly twelve and one quarter million pounds sterling or about £14 per acre, but since 1870 no such sales have taken place and since 1870 the area has been somewhat increased by purchases and otherwise. It now includes 34 square miles of forest owned jointly with private persons and 400 acres are temporarily held by the families of some of Napoleon I's generals whose right will in the course of time either lapse or be commuted. The remainder of the area is owned absolutely by the State but the enjoyment of the profits does not belong exclusively to the treasury for as will be explained hereafter certain groups of rightholders participate in it.

In the next section the principal points of laws relating to the communal forests and of their management by the State Forest Department will be brought to notice, while in the subsequent sections of this chapter the work of the department in connection with the State and the communal forests will be briefly treated of in such a manner as to bring out and compare the results obtained in the two classes of forests.

Forests belonging to Communes Sections and Public Institutions

The territory of France is divided into 36 000 communes or village communities, of which about one third are forest proprietors. Certain groups or sections of the inhabitants have however rights and own property apart from the communes in which they reside and these are also owners of considerable areas of wood land. These forests belonging to communes or sections which are susceptible of being worked on a regular system are managed directly by the State Forest Department for the benefit of their owners the principal features of this management being as follows viz. The laws relating to State forests are, generally speaking carried out with certain exceptions applicable to them, they cannot be alienated or cleared without the express and special sanction of the government in each case, they cannot be divided up among the members of the community the annual sales of produce are effected by the State forest officers and

scientific forest management

of the institutions

for the sake of convenience the forests belonging to communes and public institutions will henceforth be spoken of as communal forests.

Demarcation and Survey.

[illegible] while 30 per cent. of the communal forests had still to be dealt with. The [illegible] this work, the old maps are used for such of the forests as have not yet been surveyed. In the communal forests the work of demarcation and survey is less advanced than it is in the State forests, because the charges for such work [illegible] defrayed from the communal treasury, and the needed funds are not always forthcoming.

Systems of Culture.

[illegible] and sowing being rarely [illegible] not often [illegible]

There are two main systems of culture—one known as "high forest" and the other as "coppice."

A high forest, which is usually destined to produce timber of large size, is composed of trees that [illegible] Broadly speaking, [illegible] There are two methods [illegible] the forest in order to produce this result. In one of these the trees [illegible] mass are grouped together, and are subjected to periodical thinnings. [illegible] requirements of the young growth in the way of light, and ultimately the remainder of the old stock is removed by a "final felling." In this manner the marketable stems are gradually cut down and disposed of, the young crop being left to go through the same stages as its predecessor, and so on throughout [illegible] In [illegible] the trees [illegible] area [illegible] forest [illegible] and [illegible] work [illegible] with a [illegible] of [illegible] We [illegible] forest [illegible] art [illegible] this [illegible] classes [illegible] together, but by the selection method, on the contrary, a more or less near approach to a natural forest is obtained.

In the coppice system [illegible] principally effected by means of coppice shoots.

There are two methods of treatment [illegible] where there are no [illegible] and by [illegible] over successive portions of the forest

and *coppice under standards* in which standard trees are selected and reserved with a view to their remaining through several generations of coppice shoots, generally at least three but often four or five. Many forests are now undergoing conversion from the system of coppice to that of high forest.

The following statement shows the extent to which the two systems were applied on the State and communal forests in 1876, since which year no important changes have taken place. The areas are given in square miles.

	High forest	Under conversion.	Coppice.	Pasture.	Total.
State forests	1,948	1,191	760	225	3,734
Communal forests	2,229	54	4,508	92	7,183
Total	3,877	1,176	5,548	317	10,917

It will be seen that there is a marked difference between the State and communal forests in this respect. In the former more than three-quarters of the total area are either now under high forest or under conversion to that system, while in the latter two-thirds of the total area are under coppice and less than one-third is either under high forest or under conversion.

High forest being usually destined to produce large timber, the trees must be left standing until they have attained a considerable age, and the capital both in timber and money which is locked up in it is therefore much larger than that in a forest under coppice. On the other hand, the greater quantity of wood produced annually by such forests, and the better quality of it, owing to the greater value of the produce obtained from the high forest as compared with the coppice woods, more than counterbalance the greater rent or revenue in money which is obtained from the latter. Besides, it is found that coppice woods of a large extent in proportion to their annual yield can be managed at a smaller cost, and with less skill, than high forests; and on account of its greater simplicity the coppice system is better suited for management by communes. Coppice possesses, moreover, a further advantage for the use of the inhabitants, in that it yields more variety in kind and larger sizes than are obtainable from high forest, and it thus satisfies their requirements, which are chiefly in fuel and small-sized timber, much better than forests managed under the latter system. But even in cases where the conversion of communal coppice to high forest is deemed advisable, it was found difficult to reduce the annual fellings to the quantity necessary in order to allow the growing stock to accumulate to the required extent, while the small size of the greater part of these forests renders them unsuited to the treatment which they would have to undergo in order to effect the conversion. The coppice system, including coppice under standards, is therefore in vogue in most of the communal broad-leaved forests, such high forests as the communes possess being for the most part in mountainous regions and being composed of coniferous trees which will not coppice. The area of communal forests shown as under conversion consists principally of tracts in which the coniferous trees are spontaneously taking possession of the ground and driving out the broad-leaved species. It follows from what has been said above that the State alone can generally speaking raise broad-leaved high forests on a large scale or undertake the conversion of coppice to high forest.

A further difference between the systems of culture generally adopted for the State and the communal forests may be noted, viz., that whereas in the former

less than one fifth of the high forest is treated by the selection method the forests of the communal forest areas treated In the intensively managed where, as has just been said the greater part of the communal high forest is under the selection method preservation interests are always given precedence of economic ones and what shall exist the woodland at the expense the productive powers of the land is a question it is of forests situated in such regions are not a object at present there have been at times considerable inducements to convert selection woods into high forest and taking the State and communal forests together somewhat more than one half of the total area of their high forest is now treated in this manner

In various parts of Germany are met with practices that known in the American as "slashing" in which after the wood is removed the twigs and refuse left on the ground in order that they may give to the soil without the trouble to prepare it for the growth of a crop of weeds during the year immediately following the cutting The extent to which as carried out in France seems to be practically the same as that of slashing the crop of corn land as a method of forest cultivation is generally disapproved It is not applicable to the areas under the State forest department 2) Near Kassel in which instead of clean cutting the copses these shoots only are taken which have attained to certain size sometimes the period being periods of or after intervals varying from two to five years *Buschhau* prevails chiefly in the valley of the Sieg in the forests from which the fine supply of charcoal is drawn but it is also employed in the mountainous districts of the south in the case of forests maintained for the protection of steep slopes where it is undesirable to handle entirely

It is impossible here to enter into anything like full details regarding these various methods I must therefore refer to them as they are taught and practised in France reference must be had to books on the subject among which may be mentioned The Manual of Silviculture by Hough translated into English by Messrs Brandis and Stuart Boden Powell, and *Le traité sur les coupes* by Broilliard Berger-Levrault & Paris

Working Plans.

Working plans or schemes which in course of time be prepared for all forests are instituted in the forest department The law provides that all the forests shall be subjected to the provisions of such plans will at present those which are not private for the most extraordinary cuttings whether from the ordinary reserve or in the event of it being found necessary to convert high forest shall be made with the express sanction in each case, of the government to whom all plans must be approved before they can be adopted.

Subject to this proviso are left to the exercise of rights of user the working plan provides for the management of the forest not with a view but with a view to the interests of the proprietor Timber as a general crop which grows and is gathered at any trees take many years to grow to a marketable size the actual period that they require being dependant not only on their species and the nature of the soil under which they are grown as on the use to which they are to be put Thus a coppice being required to yield wood of small size may be cut every twenty five to forty years whereas a high forest which is destined to produce large timber must stand for a much longer time It would be unnecessary to the entire crop of such a forest were felled each once in every 100 or 120 years and it is chiefly to avoid this that a working plan is required which prescribes the arrangement necessary

out annually

thirty years.

the forest can be secured against the risk of gradual extinction

completed for more than two-thirds of the total area of the State forests and for somewhat less than one-half of the communal forests. The work progresses more slowly in the Cantonments because in these the forests have to be protected by the construction of the boundary, which is not always easy, but as a matter of course the most important forests were taken in hand first and these have for the most part been completed.

The question of working plans has only been dealt with above in an extremely superficial manner. In order to arrive at a knowledge of the systems of treatment and to frame the following works should, it is believed, be studied, viz. Arrangement descriptions of Forest Range Lewarat Pass, 1875 and Working plan of Kheri Division, U. P. Abstracts of the latter work has appeared in vols. VIII and IX. of the "Indian Forester."

Products Obtained from the Forests

[illegible] will permit.

As to tanning bark, almost the felled trees or poles will yield is utilized. Cork bark is taken from the living trees which will not bear the removal of too large a proportion of their protecting covering, and hence care has to be taken not to overwork them. Resin is collected in large quantities in forests of Khasia Pine, *Pinus excelsa*, which occurs in Kashmir, Hazara, on the outer hills and plains of the south west.

The yield of minor produce, such as grass, moss, litter and other things in small quantities, is not to be overlooked as this class of products cannot be over-worked as can timber. Next we come to the consideration of the various advantages which the forests confer on the people at large but which cannot be expressed in terms of weight of the products drawn from them.

The latest available statement of yield relates to 1876, in which year the state and communal forests taken together gave 5,620,663 cubic feet of wood, or an average of about 40 cubic feet per acre, and 1,742 tons of tanning bark, 292 tons of cork bark, and 1,967 tons of resin.

The yield of wood per acre of the State forests is somewhat small, that of the communal forests, but what is explained by the fact that the greater extent of which of grazing is permitted in the latter admits of a larger produce. It must also be remembered that a large proportion of their produce is made over to the inhabitants for their own use, and that this is [illegible] as far as possible to encourage against the [illegible] by the forest department, and [illegible] of the [illegible] which was [illegible] 4,517 cubic feet were brought under [illegible] from what has been said before regarding the various systems of cutting [illegible] State forests are the most important, the material for the wood [illegible] being of that class, whereas in the case of the communal forests, the proportion of timber is only one-fifth. A still more striking result would follow a comparison of the nature of the produce obtained from the State and from private forests and since timber is a more valuable product than firewood the advantage to a country from this point of view of considerable areas of forest land being owned by the State is apparent and the more so when it is remembered that France does not grow more than two-thirds of the amount of building timber that she consumes.

The [illegible] high forest is for the most part situated in the mountains [illegible] of coniferous trees, which explains the fact that the greater part of the timber [illegible] from the [illegible] is [illegible] almost [illegible] of that coming from the State forests [illegible]

Sales and Export

[illegible] avoided.

The second method [illegible] from the first [illegible] that [illegible] the rate at which each of the various classes of [illegible] for [illegible] be accurately estimated beforehand.

The [illegible] of timber cut and fashioned [illegible] resorted to. [illegible] advantage that [illegible] that more complete precautions can be taken [illegible] of the forest [illegible] the State or the [illegible] as the case may be [illegible] the money for the work and the [illegible] a large amount [illegible] and accounts [illegible] in the forest [illegible] from time to time [illegible] committed [illegible] not always [illegible] market [illegible] at the [illegible] interests of the country [illegible]

[illegible] by the consumers but the prices realized are not [illegible] as those which the [illegible] might have been made to fetch, had it been cut up in some other manner

[illegible]

[illegible] forest.

[illegible]

[illegible] in the open market

[illegible] The requirements of the war department are met as far as possible from the State forests, trees being marked and [illegible] the best figure [illegible] two [illegible] the [illegible] in the [illegible] were [illegible] exceed [illegible] towns [illegible] so what is required in the market

Roads and Buildings

[illegible] is [illegible] the forest accessible with [illegible] the country can be [illegible] the [illegible] and the most important [illegible] In [illegible] was [illegible] £240 a year the [illegible] was raised in 1858 to £8,000 the [illegible] At the end of [illegible] there were 244 miles of [illegible] and roads in the State forests, which [illegible] doubled

[illegible] with the forests, [illegible] guards' houses and [illegible] in 121 [illegible] The [illegible] guards' houses within them are not needed to the same extent

At the end of 1867 there were 126 saw-mills in the State forests, all worked by water-power

Timber-slides, sledge-roads, wire-rope tramways, and such like means of exporting the wood are [illegible] in France at the present time, viz., that at Baccarat at the base of the Vosges [illegible] system is to be anticipated, at any rate, in the forests of the plains. The [illegible] of large timber is almost unknown, but firewood for the supply of Paris is floated from the hills of Morvau down to the railways

Financial Results of Working

The profit derivable from a forest is dependent on a number of causes among which may be mentioned the species of which the crop is composed, the depth and nature of the soil, the climate, the system of culture, the proximity of great centres of consumption of produce, and the existence of good lines of export

Taking the average of the last three years for which the accounts have been audited, it is found that the receipts, expenditures, and surplus of the State forests were as follows, viz.:—

Revenue	£1,297,748 = 10s.	6d. per acre
Expenditure	571,347 = 4	7 "
Surplus	£726,401 = 5s.	11d. per acre

But if the money spent on the afforestation of mountain slopes and dunes, and on the purchase of additional areas be excluded the expenditure on the existing forests is reduced to about £480,000 and the surplus is raised to 6s. 8d. per acre. The actual profit is indeed slightly more than this for the figures include both expenditure by the State on the management of the communal forests, and the contributions paid by the communes on this account. The receipts are supposed to cover the payments, but they rarely do so and some allowance may be made for this fact when calculating the net profits derived from the State forests, which during the years referred to, probably fell little short of 7s. an acre. Recent information relating to the receipts expenditures and surplus resulting from the working of the communal forests is not available.

The latest year for which full details regarding the gross revenue per acre of the State and communal forests are obtainable is 1876, when the figures were as follows, viz. —

	State.	Communal.	Mean.
	s. d.	s. d.	s. d.
Principal produce (wood, bark, resin	12 6	7 5	10 0
Minor produce	0 7	0 3	0 5
Total	13 1	7 8	10 5

The revenue from the State forests was then in 1876 considerably higher than that above given as the average of the last three years, and this was due to two causes, of which the first is the exceptionally large number of windfalls which occurred in that year and the second the comparatively high rates which timber then realized. All but a small fraction of the revenue on the principal produce was obtained by the sale of wood and tanning bark, cork being produced only in the forests near the Mediterranean and in Corsica and resin almost exclusively on the shores of the south west. The figures relating to the State forests show the results of actual sales but this is not so in the case of communal forests, as a large proportion of the produce from them is made over to the inhabitants for their own use, and its value is estimated at a low rate in order to keep down the amount of their contribution for the services of the State forest department, which is levied in proportion to the sum of their gross revenue and the value of the wood delivered to them. In addition to this it should be said that the revenue on minor produce shows cash receipts only, no credit being taken for the payments made chiefly in the communes by means of days' work done in the forests. These circumstances account to some extent for the smaller revenue obtained from the communal forests but the true explanation of this result is to be found in the important influence exercised by the system of culture adopted. In 1876 it was observed that the highest rate of gross revenue was obtained from high forest, and the lowest from simple coppice, while coppice under standards occupied an intermediate place. It was also found

that in the case of high forest the area under coniferous trees yielded a much higher revenue than those under broad leaved species chiefly on account of the form of their stems, which enables a very large proportion of sawn timber to be obtained from them, but partly also from the greater value of the thinnings taken from them during the early stages of their growth in the form for example of telegraph and hop poles, etc. The revenue from forests composed of coniferous and broad leaved trees mixed together lay between these two. But of course this is not an universal rule. For a high forest of beech might yield a better return than a coppice with oak standards and a similar comparison might be made between forests stocked with other trees of different relative values and managed under various systems. The following figures showing the results of sales in the Nancy conservatorship will serve to illustrate what has been said :—

		Per acre.
Simple coppice	Yielded	4s. 4d.
Coppice under standards	"	11s. 8d.
High forest of broad leaved species	"	13s. 1d.
High forest of coniferous and broad leaved species	"	23s. 10d.
High forest of coniferous species	"	51s. 6d.

Looking then at the large proportion of the communal forests which is under coppice and at the relatively greater proportion of brushwood and timber of small size that they consequently produce the smaller gross revenue per acre that they were able to yield is no longer surprising. Taking the State and the communal forests together it was found that their gross revenue was 22 per cent. per acre higher than that of the private forests notwithstanding that these latter are as a rule on better soil and are frequently grown under other more favourable natural conditions.

The average selling rate actually realized in the State forests per load of wood of all sorts, including tanning bark, was 14s. 8d., while that obtained in the communal forests was only 9s. 8d. The corresponding rate for the whole of the French forests, including those belonging to private proprietors was 10s. 7d. so that the rate of the State forests exceeded the general average by 47 per cent. while that in the communal forests fell to 9 per cent. below it. The revenue obtained by the sale of minor produce was derived principally from shooting leases and permits.

It is not an easy matter to determine the capital value of a forest, but in 1873 an estimate was made which put that of the State forests at nearly fifty and one half million pounds sterling which is equivalent to a little over fifty pounds per acre. The gross revenue derived from them in that year represented a return of 4·15 per cent. but the net profit did not much exceed two per cent. on the estimated value. The capital value of the communal forests is certainly less per acre than that of the State forests, on account of the younger age at which the trees are generally speaking cut and notwithstanding that their revenue is smaller it is probable that they pay a higher rate of interest than the State forests.

It has been estimated that the relative rates of interest on their capital value paid by forests in which the main crop is removed at various ages, is something like the following, viz. :—

	Per cent.		Per cent.
25 years	4	60 years	2
30 "	3½	100	1
40 "	3	200	½

These figures are intended to give a general idea of the manner in which, notwithstanding the increased value of the produce the relative rate of interest declines as the age to which the trees are left standing is prolonged. They have no claim to absolute accuracy, even as representing the average of French forests, and still less can they be assumed to apply to the forests of other countries. They serve however to explain what has been previously said viz., that on account of the higher rate of interest which coppice, generally speaking, yields as well as for other reasons it is a more suitable system for communes than high forest; and this remark applies with equal and even greater force to private forests.

Rights of User.

The principal rights of user are those relating to timber firewood and grazing; but there is also a small number of others, such as those which permit the cutting of turf the collection of dead leaves, and the like injurious practices. In the State forests the right-holders are, almost without exception, village communities, the instances in which private persons possess rights in them being extremely rare. The communal forests are comparatively speaking, free from such burdens.

The law of 1827 provided for the investigation and disposal of all claims to exercise rights in the State forests, and barred the acquisition in them of any fresh ones. Hence those only have now to be dealt with which have been formally admitted and recorded in favour of the communities or persons who possess them.

The aim of the department has always been to free the forests from such claims as far as possible, and the law provides for this being done in the following manner viz., all rights of wood may be commuted by surrendering a portion of the forest itself in lieu of them, the terms being arranged by mutual consent, or in case of disagreement by the courts, but the State alone can demand such a commutation, the right-holder cannot do so. Other rights, including those of pasture cannot be got rid of in the above manner but the State can buy them out by the payment of a sum of money, the amount of which is either settled by mutual agreement or by the courts. The sale of pasture rights cannot however be enforced in places where their exercise is absolutely necessary for the inhabitants, the question of such necessity being, in case of dispute, referred to the *conseil de prefecture* * subject to an appeal to the *conseil d'etat* †. The law also provides that the exercise of all rights which have not been got rid of in either of the above ways may be reduced by the forest department with reference to the condition of the forests and the mean annual production of the material in respect of which they exist; and none can be exercised otherwise than in accordance with the provisions of the law and the rules based on it.

The principal features of the legislation regarding the exercise of wood-rights are the following, viz.: No wood can be taken which has not been formally made over by the forest department; persons who possess a right to dead fallen wood cannot employ hooks or iron instruments of any sort in its collection; when firewood is made over standing in the forest, it is felled, cut up and taken out by a contractor, selected and paid by the right-holders, but previously approved by the forest department; the partition of the wood among the inhabit-

* An administrative tribunal, established in each department of France.

† The central administrative tribunal, established at Paris for hearing appeals from the decisions of the *conseils de prefecture*.

ants cannot be made until the work is entirely completed the contractor is responsible in all respects as if he had been the purchaser of the produce but he acts under the pecuniary guarantee of the body of right holders, who cannot barter nor sell the wood made over to them, nor put it to any use other than that for which it is given to them timber made over in satisfaction of a right, but not used in a period of two years may be reclaimed by the forest department

No right can exist to take goats into either the State or the communal forests, as the grazing of these animals is considered incompatible with the maintenance of the ground under wood The old law suppressed without compensation to the right holders the practice of grazing sheep in the forests of the ancient royal domain of France and the law of 1827 suppressed it also on payment of compensation in those State forests which are of more recent origin but the government has the power to permit sheep grazing in certain localities as an exceptional and temporary measure No right to pasture any kind of animals can be exercised in any part of the forest not reserved for that purpose by the forest department which has also the power to limit the number of animals to be admitted and the period during which they may graze with reference to the condition of the forest and the quantity of grass in it Right holders can only pasture animals which they keep for their own use not those which they keep for sale

On the first of January 1877 about one half of the total area of the State forest was burdened with rights of the estimated annual value of £18,400 while only three per cent of the communal forests were so burdened, the annual value in their case being estimated at £6,000 The commutation and purchase of rights, which was commenced in a systematic manner in 1857 is effected by the officers of the ordinary service as well as by those who are charged with the framing of the working plans As a general rule the arrangement with the right holders is made by mutual consent, appeals to the courts being of rare occurrence The State is in no hurry to spend large sums in the purchase of grazing rights which will probably disappear with the progress of agriculture a result which has already been realized in the north of France, where the greater portion of these rights has lapsed through failure to exercise them

Goats, &c.

Goats, sheep and cattle have always been the enemies of forests and they are indeed the principal agents of their destruction, especially in hot and dry climates where the vegetation is not sufficiently vigorous to resist the effects of over-grazing

Animals are admitted to the forests under three different conditions, viz —

(*a*) In virtue of a right of user

(*b*) As a means of raising revenue and of utilizing the grass

(*c*) By tolerance, as a temporary arrangement.

Grazing by right This has been treated of in the preceding section

Grazing as a means of revenue and of utilizing the grass Neither goats nor sheep are admitted into the State or communal forests with this object In the State forests it is sometimes the custom to allow cottagers living near the forest to graze their cattle in exchange for a number of days' work, but this is not done to any important extent In these forests in fact very little grazing is sold, for the practice can only be permitted in the unwooded portions, which are rarely

available for the purpose because although they are of considerable extent (about 650 square miles) they are either required as grazing grounds for the cattle of right holders or they are being planted up and hence the revenue from this source is insignificant. It was only £440 during the last year for which the record is available but it is otherwise in the case of the communa forests where local custom often necessitates the maintenance as pasture land of banks which would otherwise be most advantageously lined up and some communes derive almost their entire revenue from this source. The receipts by them amounted in the same year to nearly £15,000.

Grazing by licensees. It has been said that no right can exist to graze other goats or sheep in the State or communal forests and the inhabitants of the communes are specially prohibited by law from admitting their own goats and sheep into their forests. But the government has the power to sanction the grazing of sheep and goats in certain localities under exceptional circumstances (unknown in the Swiss public forests) however very rarely accorded except in seasons of extraordinary drought when the flocks of the neighbouring communes are sometimes admitted for a single season. But in the case of the communal forests such temporary sanction is of necessity more frequently accorded for the forests belong to the inhabitants and even though their true interests might be better served by keeping out their sheep entirely it is not found possible to change their pastoral habits at once and on this account permission has frequently to be granted them to graze their sheep in their forests either for a single year or for periods of five years. They can however graze their own horned cattle, horses, ponies, donkeys and pigs there without special permission and they usually have to pay on payment of a fee into the communal treasury. According to the latest available record the number of animals of all kinds thus admitted in a single year was as follows, viz.:

Horned cattle, horses, ponies and donkeys	3,914
Pigs	45,258
Sheep (by special sanction)	936,960

The animals can however only be grazed in places which have been declared out of danger by the forest officers and their numbers can be limited with reference to the quantity of grass available but it is not always possible to enforce these restrictions and the forests in certain regions have much to contend with from the extent to which grazing is practised. The receipts by the communal treasury on this account have been estimated at 6s 6d per head of large cattle, 3s 11d per pig and 1s. for sheep; but this only represents an average revenue of 10d. per acre of the area grazed over, whereas wood yields on an average about 8s. 6d. per acre and it seems probable that this consideration may gradually lead in the agricultural districts at any rate to the abandonment of the practice of pasturing cattle on forest lands. There is no doubt that when the grazing even of large cattle is permitted it is carried on at the expense of the crop of wood and that where it is practised to any considerable extent the forest property ultimately tends to disappear and this is notably the case where for the time being local circumstances such as the absence of export roads, renders wood a less profitable crop than grass. Here the forests gradually become almost unproductive and finally succumb from excessive grazing.

About four fifths of the total area of the communal forests are still used as grazing grounds, nearly one half of the latter being open each year and the average area provided for each class of animals is about three acres per head of large cattle, two acres per pig and three-fifths of an acre for sheep. Separate

[illegible] grazing [illegible] for each class [illegible] the average [illegible] pasture [illegible] that the grazing [illegible] per head [illegible] in other countries.

OFFENCES.

Under the year 1868 persons who were charged with offences against the forest laws had always to be tried by the courts, but in that year a law was passed which enabled the forest department to take compensation [illegible] instead of bringing them before the tribunals, and this [illegible] of dealing with them is now always practised. The department [illegible] the power to charge [illegible] in the courts [illegible] the [illegible] forest [illegible] compensation [illegible] the amount of the compensation is [illegible] by way of compensation [illegible] if it is desired to exact a larger amount the sanction of the government must be obtained.

This system has many advantages. For while it is necessary in the public interests that infractions of the forest laws should be checked, a large proportion of them are offences of a petty nature, and in many cases the persons who commit them hardly deserve the severer penalties that must be inflicted on their being brought before the courts. The system of taking compensation on the other hand permits the adoption of a scale of punishment more suited to the case of offenders, while at the same time it enables the means of the [illegible] and the attendant circumstances of each case to be taken into account. The settlement can also be made more promptly, the expense of [illegible] the accused and the witnesses [illegible] before a tribunal, [illegible] of which is thus [illegible] these petty cases. The present system is [illegible] for the forest department, and that it acts very [illegible] on the persons [illegible] near the forests will be seen when it is stated that the amount of compensation exacted during the last year for which the record has been prepared amounted to [illegible] the sum which the courts must have awarded had the offenders been brought before them. Frequently the compensation is allowed to be paid in the form of a number of days' work, done in the forest.

With the increasing prosperity of the country forest offences become less frequent, and the number [illegible] is very much smaller now than it was but a few years ago. It is worthy of remark that they are more than twice as numerous in the communal as in the State forests, probably because [illegible] the inhabitants of the communes think that there is not much harm in committing depredations on property which they [illegible] regard as their own. During the year 1876 the number of offences was [illegible], there being three per thousand acres in the State forest and seven per one thousand acres in those belonging to the communes. More than half the offences were connected with the theft of wood [illegible] trees, and nearly a quarter related to pasture and cattle trespass, [illegible] persons being involved in the charges. As might be expected, wood stealing is more prevalent in winter than in summer, while the reverse is the case with regard to breaches of the grazing laws. Of the total number of charges made in 1876, 7 per cent were [illegible] owing to the trivial nature of the offences or owing to want of sufficient evidence; 70 per

cent were dealt with under the compensation law and 1 the remaining 2½ per cent were taken to court convictions being obtained in [illegible] per cent of these cases

In addition to cases dealing directly with wood-stealing, grazing and other fraudulent practices the Forest Law provides that no person having cutting instruments in his hand can leave the ordinary roads which pass through the forests and that no fire can be either lighted or carried within or at a less distance than two hundred yards from any forest boundaries. A regular tariff exists which fixes the penalties for damaging trees of various ages and species. The law also prohibits the erection without permission of brick works or mills, keeps carpenters shops, timber yards or saw mills within certain distances of the forest. At the time that the law was passed it was much more necessary than it is at present to check the erection of such buildings and applications for permission to construct them are now usually accorded on suitable conditions.

Injuries caused by Wild Animals and Insects, Storms and Fires

Wild animals and insects. The principal wild animals which cause injury to forests either by devouring the seed or the young seedlings or by peeling the bark off the young plants are deer pigs hares and rabbits. The insects which attack the leaves the bark and even the wood of trees belong chiefly to the families of *Coleoptera*, *Lepidoptera* and *Hymenoptera*. But the damage done is not excessive and it is in fact far less than that produced by the same causes in many other countries. It is of course exceedingly difficult to put a money value upon injuries of this sort which include not only the actual death of a certain number of old and young trees but also a reduction in the growth of others. An estimate was however made regarding the damage done in 1887 and it is said to have amounted to about 4s per 100 acres taken on the entire area of the State and communal forests. The coniferous trees generally suffer more than the broad leaved species as they are more exposed to the attacks of insects which do not injure the latter at all, whereas the latter species more often suffer merely a diminution in their rate of increase.

Storms. The damage done by storms of wind is a much more serious matter. Injuries are caused to the forest by them which it is not always possible either to prevent or even to modify. In the first place the wind interferes with the arrangements laid down in the working plan and the considerations which guide the execution of felling are thus thrown out. It may remove too large a proportion of the seed-bearing trees and consequently it is sometimes necessary to substitute artificial for natural regeneration which would otherwise have been effected. Again in addition to breaking or otherwise damaging standing trees by their fall. In the second place the value of the windfalls themselves is speaking generally small as they are frequently broken or otherwise injured when most of them have probably not attained the age or dimensions at which it was intended that they should be felled. They are also specially liable to attacks by insects which often appear in large numbers in forests where many trees were blown down particularly in case of the coniferous species. Even uninjured windfalls fetch a lower price than trees felled in a regular manner because they are usually found scattered here and there instead of being concentrated in one part of the forest.

The year 1870 which is the last for which figures can be obtained was a disastrous one the amount of windfalls being exceptionally large probably double of that which occurs during an average year. The number was put

at 114 700 trees and the damage caused was estimated at £10 80 or about £3 6s per 100 acres in the State forests and 12s per 100 acres in those belonging to village communities.

The latter being for the most part copses under short-term rotations suffered less than the former where the proportion of windfalls in the ever-forests was greater than that in the management of broad-leaved species. The windfalls in 1907 were sold for nearly £621 000

The forest officers were engaged in [illegible] are careful to prevent as far as possible against the effect of storms by leaving a protecting belt of trees standing on the side of the forest from which the [illegible] and in other ways. It must however be remembered that [illegible] their control such as the configuration of the ground the character of the neighbouring [illegible] the nature of the soil and its power of retaining the hold of trees and their root development, as well as their size, age and the system of treatment to which they have been subjected

It may be added that hailstorms often do great damage by stripping the trees of their foliage, and by breaking or otherwise injuring the young plants

Fires. The [illegible] for the prevention of [illegible] forest fires under ordinary circumstances and the forest law [illegible] the duties of carrying [illegible] There are [illegible] 200 yards of their boundaries but in ordinary years [illegible] from setting fire to their own forests to the danger of their neighbours' property This an important question in the Maures and Esterel[1] where the best practice is the [illegible] of systematically burning down the forests [illegible] burn up the heather and other shrubs which [illegible] with the regeneration of the cork trees and in 1907 a special law was passed prohibiting the [illegible] these districts from [illegible] This law [illegible] and has [illegible] but the [illegible] have not been completely freed from all inflammable shrubs

In 1907 there were 290 fires in the area managed by the forest department nearly all of them being the result of accident. The surface burnt over amounted to 2 [illegible] 0 acres, or about $\frac{1}{4000}$ part of the entire area, and the damage was estimated at £2 250 or 2½ francs per hectare of forest burnt. The percentage of fires was greater in the broad-leaved than in the coniferous forests, but on the other hand the amount of damage per acre in the latter was three times as great as in the former the trees in the former being more valuable and in the best condition for the growth resulting fire. It is worthy of remark that although on a general view fires were of more frequent occurrence in the spring than at any other season of the year the autumn fires were the most destructive, as for the most part they [illegible] is by no means free of danger and [illegible] must be mainly ascribed to the great damage done by fires occurring during the autumn in the woods of France In the north forest fires are of small importance and seldom cause damage

Hunting and Shooting

The right of hunting and shooting in the State forests is generally speaking not sold on the areas which are sold by public auction under the rules for the sale of timber and other forest produce but when this is not possible it is usually granted annually by permits issued under the direct authority of the Minister

[1] Low mountain ranges in the south of France

of Agriculture the sport being always carried on under the supervision of the officers of the forest department. No forest officer can become a lessee of the shooting within the limits of his own charge and the forest guards are never permitted to shoot in the forests under any circumstances.

The municipal councils are subject to the approval of the prefect free to dispose of the right to hunt or shoot in their forests in any manner that they wish.

Destruction of Wolves.

The destruction of wolves bears and other animals which are considered dangerous or harmful is entrusted to a corps of 410 *lieutenants de louveterie* or wolf hunters. These officers, who are unpaid but have the right to wear a handsome uniform are under the control of the conservator of forests and are appointed by the prefect on his recommendation. They are as a rule landed proprietors who accept their appointment for the sake of the sport it affords them. They are obliged to keep certain packs and packs of dogs and are charged to organize and direct in conjunction with the local forest officers the *battues* which are from time to time ordered to take place in the forests. But as this system has not been found a very efficient one a law has recently been passed under which a reward varying from £1 12s. to £7 is payable to any one who kills a wolf and the mayors are authorized when the snow is on the ground to organize *battues* for the destruction of wolves bears and other animals anywhere within the limits of their respective communes on condition only that they give due notice to the proprietors of the lands on which the beat is to take place.

The rewards paid for killing wolves amount to about £4,000 a year.

Afforestation Works. Works Undertaken for the Consolidation and Protection of Unstable Mountain Slopes.

Excessive grazing both by large herds and flocks principally of sheep and goats as well as by vast numbers of these animals which are annually driven up from the plains to the hill pastures have produced complete denudation over very large areas and have thus caused incalculable damage in the great mountain regions of France principally in the southern Alps and in the level country below them. They eat down the grass to the level of the ground and then tear out the very roots breaking up the surface of the soil and rendering it liable to be washed down by the rain. These hills are of a loose formation the strata being contorted and dislocated to a remarkable degree and as soon as the soil is deprived of its protective covering of trees shrubs and herbs whose roots hold it together the sapping and mining of the mountain sides are prosecuted with a constantly increasing intensity. The rain-water no longer intercepted in its fall retarded by the spongy vegetable mould nor hindered in its downward flow by the thousands of obstacles which a living covering would oppose to its progress flows off the surface of the ground with extraordinary rapidity and carrying with it large quantities of loose soil and debris fills up the torrent beds. These latter scoured out by the rush of water charged with mud stones and rocks cut their way deeper and deeper into the mountains and their banks deprived of their support at the base fall inward, the *débris* being borne onward to level ground below. The cracks and slips occasioned in this manner extend to a great distance on either side of the torrent especially on the side on which the strata slopes toward it and the effect is much increased when the upper layer of rock is loose and lies upon an impervious bed the water then saturates

[illegible] ever becoming so, could not for a a moment be justified

Works undertaken by the State.—The proposal to take up ground for this purpose emanates from the forest department and is followed by a formal inquiry under the direction of the district officer. In the circumstances of the case requiring it a special commission with a forest officer as one of its members makes a report. If the proposal is approved a law is passed declaring the work to be one of public utility and under it the ground may be acquired either by the proprietors of their consent or it is bought by the State either by mutual agreement or by expropriation. The area is then under the forest law and the works are undertaken at the public cost.

Works undertaken by the proprietors.—If however the proprietors who are for the most part village communities do not desire to part with the land they must help in the reforestation. Law has been created anew to execute the special works themselves within a fixed time and to maintain them under the control of the forest department. Income taxes but not always pecuniary aid is often afforded to them. If the proprietors of land outside the areas which are taken up for treatment as works of public utility desire to undertake measures for the consolidation of the soil or for the improvement of their pastures they can obtain assistance from the State in the way of money grass plants or of work done for them. But when any such aid is afforded the operations are under the supervision of the forest department and in certain cases the money so advanced has to be refunded.

Preventive measures.—When the condition of the ground is not such as to warrant its being dealt with in the above manner it may after the same preliminary formalities as before be closed against grazing for any period not exceeding ten years in which case compensation is paid annually to the proprietors for their loss of the use of it. During this interval the State has the power to execute works in order to promote the more rapid consolidation of the soil, but the nature of the property cannot be changed thereby and the proprietor cannot be called upon to pay anything for the improvements thus effected. When at last after the lapse of ten years it is found necessary to continue the exclusion of cattle the State must buy the land either by mutual agreement or by expropriation.

But none of the measures above described would deal effectually with the situation unless the source of the evil were at the same time attacked by bringing the pastoral arrangements on the neighboring lands under control so as to avoid over grazing; and the law therefore provides that in all village communities and those in which works are undertaken being permitted as well as many others the grazing must be carried out in the manner approved by the forest department. The communes are therefore obliged to submit to the district authorities for approval a project showing the nature and extent of their pasture lands the portions that they propose to use during the year the number of animals of each kind that are to graze the roads by which they are to reach and return from the pastures and other matters. These proposals are considered by the forest department and modified if necessary. In addition to this with a view to encourage the pastoral population of the mountains to take care of their grazing grounds and to put a stop to abuses resulting from ignorance and from the continuance of ancient customs the forest department is empowered to grant money rewards to *fruitières* associations of cultivators for the manufacture of cheese for improvement made by them to their pastures. It is also desired to encourage as far as possible the winter tutoring of ewes for sheep but the population of the mountains does not lend itself to the effectual use of their grazing grounds and the principal reason for the offer of rewards by the State is that it is con-

sidered politic to do something to aid them in their industry as some set-off against the inconvenience to which individual communities are sometimes put by these operations.

Scope and progress of the entire work.—The total surface to be treated as a work of public utility in the Alps, Pyrenees, and Cevennes is estimated to amount to 1,060 square miles, in addition to about 1,800 linear miles of torrent beds. Up to the end of 1885, 152 square miles of this surface and 373 miles of torrent beds had been completed, the expenditures having amounted to £819,320, and the rates having varied from £3 2s. 0d. per acre and from 2s. to 7s. 0d. per linear yard of torrent bed. There remain to be treated hereafter about 883 square miles of surface and 1,500 miles of torrent beds. In addition to the above the State has paid £148,000 or half the cost of treating 212 square miles as "preventive works" under the 1882 law, and £12,000 toward pastoral improvements.

Draining and Planting of Swamps and Waste Lands.

Measures of the nature above described for the consolidation and protection of mountain slopes are undertaken in the interest of the population generally. In the case of similar unproductive wastes or swamps not requiring to be dealt with on these grounds, the government has thought it better as a general rule to leave each proprietor free to do what he considers most to his own advantage, confining it to the exemption from taxes for twenty years of all lands planted up. But the State has the right to force the communes to drain their swamps and wastes with a view to rendering them suitable either for cultivation or for the growth of trees; and when this is done advances of funds may be made under certain conditions, one of which is that the commune has the right to surrender to the State in satisfaction of all claims a portion of the area not exceeding one-half.

The Dunes of the West Coast

The winds that blow continually from the ocean on to the west coast, carry with them enormous quantities of sand which advancing steadily over the country at the rate of some fourteen feet per annum in the form of moving hills called dunes, bury under them the fields and villages they reach. It has been calculated that nearly ninety cubic yards of sand per yard of coast line are thus annually transported inland. Works to arrest the destructive effects of this invasion of sand have been in progress since 1787; they were originally carried out under the Department of Public Works, but since 1862 they have been placed under the forest department. The total area of the dunes is said to be 224,154 acres, a part of which belongs to the State, and a part to private owners, while a much smaller portion is communal property.

In exposed situations the protective works consist of a wooden palisade, erected at a short distance above high water mark, and destined to promote the formation of an artificial dune with a view to prevent fresh arrivals of sand from being blown over the country. Under its shelter seeds of various kinds, principally those of the maritime pine (*Pinus maritima*), broom, gorse, and gourlet (*Arundo arenaria*), are sown, and the seeds being covered with brush-wood to prevent the sand in which they are sown from moving, and the sowing is thus continued inland in successive belts, until a crop of trees is raised on the entire area. In less exposed situations a wattled fence is substituted for the wooden palisades. In the Departments of Gironde and Landes forests of the maritime pine have been most successfully raised in this manner, the trees being tapped for

resin, and the wood of those which have been exhausted being sold for railway sleepers and other purposes. But north of the Loire the maritime pine is not sown, as in that region it does not yield a sufficient quantity of resin to repay the cost of its introduction, and here it is sought merely to establish a crop of grass on the ground.

The law of 1810 relative to the treatment of the dunes, which is still in force, provides that the government can order the planting up of any area which in the public interest requires to be so dealt with. When the land or any part of it belongs to communes or private proprietors, who cannot or do not wish to undertake the work, the State can execute it, reimbursing itself with interest from the subsequent yield of the forests. As soon as the money so advanced has been recovered, the land is restored to the proprietors, who are bound to maintain the works in good condition and not to fell any trees without sanction of the forest department. This system of raising forests on private lands would not be likely to succeed elsewhere but here the extremely profitable cultivation of the maritime pine, due to the large quantity of valuable resin that it yields in the hot and moist climate of the south west littoral coast, renders it a safe transaction for the State to engage in.

Before the forest department took over the work in 1862, 111,787 acres had been dealt with, and the entire area has now been completed. The works have to be most scrupulously maintained in order to prevent a recurrence of the evil.

ADMINISTRATIVE ORGANIZATION AND DEPARTMENT STAFF

Administrative Organization. In order to carry out the work which has been briefly described in the preceding chapters, a corps of professional foresters, composed as follows, is maintained, viz.:—

1	Director of the forest department.	superior staff.
9	Inspectors-general.	
39	Conservators.	
245	Inspectors.	
234	Assistant-inspectors.	
308	Sub-assistant-inspectors (*gardes generaux*)	
3032	Brigadiers (head guards) and guards,	subordinate staff.

This body of officials is employed, partly in the ordinary duties of the department, as being in administrative, executive, or protective charge of the units into which the forests (including those of Algeria) are grouped, for their more effective and convenient control, partly in special branches such as those which are charged with the preparation of working plans with the treatment of unstable mountains, and with the communal grazing arrangements, and partly also in the central offices at Paris. The following statement shows the number of officers of the superior staff employed on each kind of duty.

	Director	Inspectors-general	Conservators.	Inspectors.	Assistant inspectors.	Sub-assistant inspectors.	Total.
Central offices	1	8		10	12	2	33
Ordinary duties			35	180	177	209	601
Working-plans branch				15	14	6	35
Consolidation of mountain slopes				15	12	49	76
Communal grazing				2	2	1	5
Schools		1	1	3	6		11*
Algeria			3	17	10	37	67
Detached duty				3	1	4	8
Total on active list	1	9	39	245	231	308	836

* Exclusive of two forest officers who have been removed from the active list as professors and three professors who are not forest officers.

The Central Offices at Paris.

Since 1877 the forest department has been under the Minister of Agriculture instead of, as formerly under the Minister of Finance. And the change has proved a most beneficial one, for the forests are now regarded more from the point of view of their utility in augmenting the general prosperity of the country, than from that of the money revenue they can be made to yield; and they are no longer looked upon as available for sale whenever the low state of the exchequer may seem to suggest this course, which was not seldom in olden days. The Minister of Agriculture is the president and the director of the forest department is the vice president of a council of administration formed by the eight inspectors-general, which considers all questions submitted for the orders of government. The central office is divided into seven sections, each of which deals with certain branches of the work, and is presided over by an inspector-in-charge, who is assisted by two or three other forest officers and a number of clerks.

Ordinary duties in the forests. The unit of administrative charge is the division (*inspection*) which is held by an inspector; but for purposes of executive management this charge is split up into sub-divisions (cantonments), under assistant or sub-assistant-inspectors, who are also at the disposal of the inspector for any special work that he may require of them. Occasionally, when the division is a small one, the inspector himself holds charge of a sub-division. The divisions are grouped into conservatorships, and these again into six circles (*regions*) each of the latter being assigned to an inspector-general. The forests, State and communal, managed by the forest department are 11,508 square miles in extent, and they are divided into 414 sub-divisions, 192 divisions, and thirty-five conservatorships; consequently, the average area of each of these charges is as follows, viz. sub-division, twenty-eight square miles; division, sixty square miles; conservatorship, 329 square miles. The average area of an inspector-general's circle extends over 1,918 square miles.

The sub-divisional officer is essentially an out-of-doors man, who personally directs all work going on within the limits of his charge, in accordance with the instructions given to him by the inspector whose assistant he is, and who can at his discretion employ him on special duties outside his sub-division. The divisional officer is the manager of the forest estates. He prepares projects for the various

works that are to be undertaken and fixes the estimate thereon. Once [illegible] he is now the principal man once again to [illegible] of forest officers. The conservator exercises a general control over the subordinate officers employed under him and it is his duty to see that all work is carried on in accordance with the rules of the department as they are from time to time communicated to him from the central office. He is the head of the circle and has power to issue orders to the [illegible] treasurers. As regards the duties the respective grades of subordinate officers [illegible] he makes an annual tour and a personal inspection of the whole of the work [illegible] and with the assistance of the [illegible] satisfies himself that each [illegible] properly. During the remainder of the year he is at head quarters where he has a [illegible] at the central branch of the office [illegible] by advising the government both in the [illegible] of selected officers to the service and [illegible] for promotion to fill the vacancies that may occur

It may here be mentioned that in addition to the charge of the State and communal forests the officers of the department are called upon to perform certain functions in the private forests which will be examined hereafter.

Working plans.—A separate branch of the department is charged with the framing of working plans for the most important forests, those for the smaller ones being prepared by the local officers. The chiefs have between them assistant and out assistant inspectors who are thus employed and are divided into two sections which are at present working in twenty four conservancies. As the operations are completed in the forests the two sections are moved to another. The officers are under the orders of the local conservator who transmits their proposals to head-quarters with his own opinions and recommendations.

Construction of mountain slopes.—The branch of the department to which the road undertakings is intrusted is presided over by an inspector general and is composed of seventy six officers of the superior staff working in eight town centres. These officers are under the orders of the conservator within whose charge they are employed and he transmits their proposals and programmes to the inspector general who is thus enabled by the exercise of his superior skill to utilise the experiences gained in the various localities for the benefit of the entire work. The inspector general reports to the director of the department all matters relating to this undertaking which are to be laid before the council of administration.

Communal grazing arrangements.—The five officers who are employed in the three great mountain regions to prepare projects for the control of the communal grazing arrangements and the issue of rewards for improvements to the pastures effected by the free [illegible] of cheese making [illegible] are placed in the same relation to the conservators as are the officers employed on the consolidation of mountain slopes.

Accounts.—It is a fundamental principle of the French system of forest administration that the forest officers have nothing to do with either the receipt or the payment of money. They sell the produce by auction or by the granting of permits as the case may be, but the sums realized on account of such sales are paid by the purchasers direct to the public or communal treasurer. The inspector prepares a budget estimate for the proposed expenditure on works and when it has been sanctioned the various undertakings are commenced. Towards the end of each month he submits to the conservator an estimate of his proposed expenditure for the following month during the last days of which that sum is paid to him and he distributes it at once among the workers together with the unexpended balance should there be any. In the treasurer general he keeps

no money in his hands. In exceptional cases however the conservator can grant orders for advances to the officers employed under him but in this case they must at the end of each month adjust the advance by vouchers handed in to the treasurer general along with any balance of cash that may remain unexpended in their hands. The treasurer general thus keeps a complete check of receipts and expenditure of the department.

Departmental staff. Members of the forest department are ineligible for any office other than administrative or judicial; they are prohibited from engaging in trade or in any industry connected with wood and they must before they can enter upon the execution of their functions.

They have as regards forest offences the powers of police including the right to make domiciliary visits for purposes of investigation and to arrest suspected persons. But these powers are exercised chiefly by the members of the subordinate staff. Officers of the superior staff act as public prosecutors in forest cases.

Superior staff. Candidates for the superior staff are as a rule trained at the national forest school at Nancy but one third of the appointments to the lowest grade (*sous-inspecteurs*) are reserved for the promotion of deserving subordinates. A young forest officer on leaving the school is employed for a time usually about a year in learning his duties under an inspector and his advancement from this probationary stage as well as his further promotion through the higher grades depends on his own qualifications and exertions as reported by his immediate superiors.

A promotion list is drawn up every year by the council of administration and published for general information. On it are inscribed the names of those officers of each grade who are considered to be the most deserving of immediate promotion the number of names on the list being limited to three times the number of the anticipated vacancies.

The minister of agriculture makes all promotions up to and including the grade of inspector but the conservators the inspectors general and the director of the department are nominated by the president of the republic. No officer can however be accepted for promotion whose name is not borne on the list and who has not served at least two years in the lower grade.

The yearly pay of the various grades is as follows:

	£		£
Director of the forest department			800
Inspectors-general, three classes	480	to	600
Conservators, four classes	320	to	480
Inspectors, four classes	160	to	240
Assistant-inspectors, three classes	120	to	152
Sub-assistant-inspectors, three classes	80	to	104
Sub-assistant-inspectors, on probation			60

In addition to the salaries the officers receive travelling allowances usually a fixed sum per annum at various rates according to local circumstances.

A pension at a rate which varies according to the grade of the retiring officer is obtainable after the age of sixty years but no inspector can become a conservator after he has passed the age of fifty five years. Conservators are usually pensioned at the age of sixty two and inspectors general at sixty five.

Subordinate staff. All members of the subordinate staff must have served in the army and as a general rule they must have attained the rank of non commissioned officers they cannot be less than twenty two or more than thirty five years of age at the time of their appointment. They receive their first nomination from the minister of agriculture, who promotes them from a list similar to that which is annually prepared for the superior staff. The scale of annual salaries

[illegible], head guard, three classes, £36 to £44, guard, two classes, £28 and £30 with an additional £2 after fifteen years service

They must live in or near the forests where they are employed as far as possible with accommodation for themselves and their families at places specially built for them. But if such houses are not available they receive a [illegible] allowance. In addition to their pay they are [illegible] and get ammunition and they are allowed to cultivate a plot of [illegible] and one-half acres, and to graze two cows in the forest.

Each [illegible] has a beat which he is expected to visit [illegible] the average size of such beats being about [illegible] square miles. The head guard has four or five guards under his orders to whom he gives their work and [illegible] officer.

The duties of the [illegible] staff are [illegible] They act as forest police and have the power [illegible] They are required to [illegible] and [illegible] they fail to [illegible] they become [illegible] for any loss or compensation money which cannot be levied from the delinquent. Acts under the Fires Act [illegible] and in addition to this duty [illegible] the costs of their charge and in addition to this duty [illegible] and the cutting [illegible] the stems of the [illegible] in the forest and perform such like [illegible] Certain hands formerly are given annually to men who have [illegible] in this manner but they are [illegible] to accept [illegible] entirely from [illegible] in the execution of their duties. They are [illegible] attained the age of fifty five years and have completed twenty years service including the time spent in the army.

No state [illegible] the [illegible] to the grade of [illegible] inspector are reserved for the promotion of deserving members of the [illegible] staff. Ordinarily men so promoted must have at least fifteen years service and be less than fifty years of age but they can be promoted after four years service if they have passed successfully through the secondary school at Harrow.

Military Organisation. [illegible] the law which provides that a [illegible] in time of peace to regularly organised [illegible] service can in time of war be formed into special corps destined to serve with the artillery [illegible] army the members of the forest department form a part of the military forces of the country and the [illegible] and the [illegible] staff are organised in companies [illegible] sections according to their maximum strength. In case of the mobilisation of the army the latest [illegible] at the expense of the war minister and its various [illegible] points. The [illegible] of the forest [illegible] at Nancy receive [illegible] instruction and are [illegible] the time passed at the [illegible] The officers of the [illegible] staff hold ranks as officers of the reserve of the territorial army and in time of war may be employed either in connection with the communications and services of the forest corps or as may be deemed best from the fact that they are enrolled as the combatant part of an integral part of the army and enjoy the same rights honours and rewards as the other troops which compose it. They are inspected by the [illegible] and in time of peace and the head guards and guards may [illegible] the non-commissioned officers and rank and file [illegible] certain privileges as soldiers.

In virtue of this service a military uniform is prescribed for all grades, including the students at the schools. The subordinates wear it always, and the officers do so on all ceremonial occasions in making official inspections of the forests by their superiors.

FOREST SCHOOLS.—THE HIGHER SCHOOL AT NANCY

The forest school at Nancy is the only one existing in France for the training of officers of the superior staff. It was founded in 1824 before which year the department was recruited either by means of young men often of good families who worked gratuitously in the inspectors' offices in the hope of ultimately obtaining an appointment or by means of retired officers of the army. Very few forest officers received under the old system a professional training sufficient to enable them to discharge their duties satisfactorily and it was to remedy this state of things that the school was established. The arrangements were imperfect at first but a great development has taken place during the sixty two years that have elapsed since 1824. The present organization of the school will now be briefly described.

The controlling and teaching staff is composed as follows, viz. —

1 director with the rank of inspector general (professor of political economy and forest statistics).
1 deputy-director (professor of forestry).
1 assistant professor of forestry.
1 inspector of studies (professor of law).
1 assistant-professor of law.
1 professor of natural history.
1 assistant-professor of natural history.
1 professor of applied mathematics.
1 assistant-professor of applied mathematics.
1 professor of agriculture.
1 professor of German.
1 professor of military science.
1 assistant-inspector for experiments.

All these are forest officers except the professors of agriculture German and military science and none of them, except the professor of agriculture who is dean of the faculty of science at Nancy, have any other duties.

The salary of the director rises from £360 to £480 with £80 a year extra for travelling expenses. The professors of forestry natural history law and applied mathematics receive at first appointment £80 a year and rise to the pay of their grade whatever it may be but if after some years they desire to be permanently attached to the school they may be removed from the active list in a society rising from £280 to £360 a year when they are entitled to a higher rate of pension than they would otherwise receive. The assistants take part in the instruction under the control and guidance of professors, whom they are in training to succeed, they receive £40 a year in addition to the pay of their grade. The salaries of the professors of agriculture German and military science are fixed from time to time the maximum rate being £240. The appointment of deputy director and inspector of studies do not entitle their holders to any extra pay but these officers as well as the director have free quarters at the school. The staff is completed with an accountant, two adjutants (corresponding to sergeant majors), a surgeon, a gate keeper and other subordinates.

The director of the school is the president and the professors and assistants are the members of a council of instruction which assembles at the school from time to time to consider any matter which may be brought before it by the director.

A council sits at Paris at least once a year for the consideration of such general questions as may be brought before it relative to the instruction given at the forest schools at Nancy and Barres and the conditions of admission to and the regulations in force at those institutions. The president of agriculture, members appointed by a minister of the crown, the director of the forest department, the director of agriculture, the agriculture professors and inspector general of forests. The professors of the forest school at Nancy and Barres, a conservator of forests, a retired forest officer, the secretary of the agricultural institute, a member of the national agricultural society, an inspector general of mines, a chief engineer of naval construction, the reporter of surveying from the military school, and an officer of the army.

A pupil on the entrance examination must be between the ages of eighteen and twenty two years, must be in sound health and hold a certificate showing that they have completed their course of general studies at the lycée or high school. The subjects in which they are required to pass the entrance examination are as follows, viz.

Arithmetic, elementary geometry, algebra, trigonometry, analytical geometry, descriptive geometry, natural philosophy, organic and inorganic chemistry, mineralogy, mechanics, the German language, history, general and political geography, and plan drawing. Two passed students from the agricultural institute and two from the polytechnic school can, if they wish, be admitted every year without further examination. The number of cadets taken annually is as a general rule from fifteen to eighteen, and the course of study extends over two years, so that there are from about thirty to thirty six regular students at the school at the same time. They are styled externs while at Nancy as they live in the town, but on joining the camp they become internes. The parents have to pay a year for their maintenance, including the purchase of books and instruments, but they are not required to pay anything for their instruction. The annual expenses of the school, which may be estimated as follows, viz.

Salaries, scholarships, tours and examinations	£4170
Maintenance of the buildings, library, museum, etc	742
Total annual payments by government	£4912

If the number of students passed annually through the school be taken as fifteen and a half the annual expenditure per head for the entire period of their course comes to £318. But if interest at five per cent on the capital invested in the buildings and museums (£14,840) be added the annual expenditure becomes £702 and the amount spent by the State on each student during the period of his training is raised to about £350.

Each year of study at the school comprises six and a half months of lectures and two and a half months of practical instruction, the months being devoted to examinations and there being two months of vacation. During the period devoted to practical instruction the pupils are taught in the first year agriculture in all its branches, botany, including vegetable anatomy and physiology as well as the classification of plants and their geographical distribution, special attention being paid to forest trees and shrubs, practical exercises with special reference to forests, forest statistics, saw milling, forest laws and rules, together with such general knowledge of the common law of the

country as is judged necessary surveying and the construction of roads the German language, military science riding. Second year, working-plans [illegible] branch relating to the insects which attack trees; agriculture; [illegible] houses, saw-mills and bridges, the treatment of torrent beds, [illegible] given in the class rooms

[illegible] other things

[illegible] are worth £10,000, total £22,000.

[illegible] instructed with the charge of a sub[illegible]

[illegible] remainder were foreigners of other countries

[illegible]

Government. Ordinarily the free students merely attend the lectures and as a matter of course are not examined, but the bursh students have to pass the school examinations.

The Secondary and Primary Schools at Barres

The secondary school was established in 1824 in order to train a class of men who should occupy an intermediate position between the officers of the superior and those of the subordinate staff. Of the students who entered in that year seventeen passed out as head guards and one of these has been promoted to the superior staff as a sub-assistant inspector. But the school was reorganized in 1858 and it is now maintained in order to facilitate the entrance of students into the subordinate staff by encouraging the education of such of them as may be deemed otherwise fitted for advancement. Candidates for admission to the school are selected by the conservators from among those of their local guards and peasants who are thought to possess the needful qualifications and to be capable of passing the required examinations. They must have completed four years' service in the forests and be under twenty-five years of age, but passed students of the primary school can be admitted after two years' service in the forests. They are subjected to an entrance examination in the following subjects, viz.: Dictation, elementary geometry, French history, French grammar, timber measurement, the selection and marking of trees to be felled or reserved, and the duties of forest subordinates generally.

The Director of the school is a conservator of forests who receives the pay of his grade and free quarters. He is assisted in the administration and teaching by two assistant inspectors, each of whom receives an allowance of £40 a year in addition to his pay. Teachers who are not forest officers can be employed when local circumstances require. As in the case of Nancy, the Director and the professors form a council of instruction and discipline. The students have to rank and wear the uniform of a forest guard. They are classified in order of merit at the end of each year, and receive certificates of conduct and proficiency.

The extent to which each of the years is kept separate and special or common, the object being to combine the general education of the students as much as possible with a practical training in forestry and practical as may be taken for the purposes they have in view. The course is arranged as follows, viz.:

First year.—Surveying, the use of the sight and compass, the use of scales of chains and rules of timber measure, forest practice, arithmetic and geometry, the principles of algebra and trigonometry, surveying and map-drawing, elementary forest law, the elements of forest botany, the study of vegetable organs and physiology, and the classification of the principal forest trees, planting, and sowing, and geography.

Second year.—Working plans, boundings and roads, the construction of timber ramps, gauges, and scales, the treatment of forests and various forest laws and regulations, the elements of mensuration of solids, agriculture, and agricultural chemistry, literature and the language of France. Most of the above subjects are taught not only in the class room but also practically in the forest. The school possesses a property purchased before 1875 for the primary school from M. Vuillemin, who had raised on it a large number of exotic trees of various kinds. There is also on the estate a small forest treated as a coppice under standards which, with the State Forest of Montagne, situated at a short distance from the school, is used for the practical instruction of the students. The buildings comprise the residence of the Director, the class rooms and students' quarters as well as a museum containing collections to illustrate the various courses of study.

The examinations are conducted by the Director of the Forest Department and inspector general assisted by [illegible] and the students who pass, under the new organization be appointed to the superior staff as [illegible] inspectors. Like the three trained at Nancy they will be employed for about a year in learning their future duties as inspector after which they will become eligible for further promotion in their turn to be the other officers of the department. Subordinates from the communal forests are permitted to pass into the superior grades of the government service through the [illegible]. Nine students entered at Spring 1884 and [illegible] and are now under instruction eight of them having previously passed through the primary school. The two students formed the courses for a short time in 1883.

The primary school is a branch of the establishment at Nancy the instruction being given by the [illegible] and professors of the secondary school. It was established in 1875 for the training of young men who intend to enter the subordinate grades of the forest guards or head of forest [illegible] as guards of woods belonging to [illegible] communes or [illegible] proprietors. Up to the year 1884, 63 students had passed through it, from the [illegible] were appointed to the [illegible] and [illegible] the necessary age. But in 1884 the primary school was reorganized, and it became essential, in the interests of the body of forest officers and of the service, that more care should be taken to enter the [illegible] only such forest guards as had a sufficient share of [illegible] to pass the ranks of the superior staff through the secondary school.

Candidates must be between twenty-four and twenty-seven years of age. They must have completed their military service and must produce satisfactory certificates [illegible]. They are obliged to pass an entrance examination in the following subjects:—French composition, arithmetic, algebra, and the elements of history and geography. Within a month they are placed [illegible] quarters are provided for them and they receive from government a part of their subsistence, an allowance of £1 10s. a month to provide themselves with food and clothes.

The course occupies two years and embraces the following subjects viz.:—Arithmetic, practical geometry, geometrical drawing, surveying and levelling, the French language, French history and geography, the elements of physics, the elements of forest botany, mineralogy, elementary anatomy, physiology, and the classification of the principal forest trees, and the elements of forest law and administration. The instruction is partly in the class rooms and partly in the form of practical work done in the forests.

Passed students are on vacation sent as assistants to the government service as forests guards of the second class, and after two years passed in the forests in that capacity they are eligible for entrance into the secondary school. During 1883 and 1884 by merit only three pupils entered the primary school, two of whom are still there and one has received his appointment.

Free students can be admitted with the sanction of the Director of the forest department but as yet none have entered the school.

THE PRIVATE WOODS AND FORESTS OF FRANCE.

The woods and forests which are neither State nor communal property belong principally to private proprietors of whom the number is very great but some portion to civil companies and other societies. Their extent varies of course from year to year as [illegible] as clearances are made for cultivation or planting work is undertaken. No very exact record of the area is available but the latest figures show it to be [illegible] acres or about two-thirds

of the total wooded surface of France. It is probable that at the present time the private woodlands are being somewhat added to rather than reduced for it is believed that the areas annually planted up or sown exceed in extent those which are cleared. The private forests are not entirely free from State control, while at the same time they are protected by the legislation almost in the same manner and to the same extent as are the State and communal forests. For instance private owners in common with the government and the communes, enjoy the power to free their forests from wood rights by making over a portion of the ground to the right holders in lieu thereof. Grazing rights can only be exercised in those parts of them which are declared by the forest department to be out of danger from the entrance of cattle and the number of animals can be limited with reference to the supply of grass while no right can exist to graze sheep or goats in them. Owners have also the power to free their forests of all rights except those of wood by the payment of compensation and speaking generally it may be said that they have the same protection against injury to their property by right holders as is enjoyed by the State and the communes. The law also places them in the same position as regards the punishment of forest offences including trespass by persons carrying cutting tools cattle trespass and the igniting or carrying of fire in or near the forests with a claim to damages for injury caused. Proprietors can obtain for their forest guards if they have them regularly sworn in the same powers for the protection of their property as are exercised by the State and communal guards.

On the other hand private owners cannot cut down and clear their forests without notifying their intention to do so at least four months beforehand and the forest department can with certain exceptions successfully oppose the clearance if the maintenance of the woods is desirable on any of the following grounds, viz.:—

1. To protect mountain slopes.
2. To protect the soil from erosion, and to prevent encroachments by rivers, streams or torrents.
3. To preserve springs and water-courses.
4. To protect coasts against the erosion by the sea and the encroachments of moving sand.
5. For the defence of the national frontier.
6. For sanitary reasons.

The minister of agriculture decides whether the clearance may be made or not. Between the years of 1828 and 1884 sanction has been accorded to the clearing of 1795 square miles of private woodlands but there is no record showing what proportion of this area has actually been cleared and it is known that sanction is sometimes obtained merely to give an enhanced value to the property by the removal of restrictions on it. It is worthy of remark however that while the average area of which the clearance was annually authorized during the whole period above mentioned amounted to 20 160 acres the average during the last ten years was 5 404 acres and during the last five years it was only 3 741 acres. These figures seem to show that woods are acquiring an increased value in France and that they are cleared for cultivation to a less extent than formerly.

It has already been said that there is a special law relating to the forests of the Maures and Esterel where fires are systematically lighted in order to get rid of the injurious undergrowth and that under it private proprietors in those regions are only permitted to light forest fires at certain seasons while they are compelled to cut fire lines round all woods which are not completely cleared of inflammable shrubs.

The manner in which the laws relating to the consolidation of mountain slopes and the planting of the dunes affect private owners has also been briefly explained in a previous chapter.

What has already been said regarding the systems of culture generally adopted for the State and communal forests respectively will lead to the correct conclusion that those belonging to private owners are as a rule treated as simple coppice or coppice-under-standards, the private high forests being usually composed of coniferous trees and situated in mountainous regions. But many of the forests that have been planted in the plains of the Landes, Sologne and Champagne are stocked with coniferous species which are frequently more suited to the local conditions, and from which they yield a better revenue than could be derived from other kinds of trees. Notwithstanding that the private forests are as a rule more favourably situated than those owned by the State or by communities, the revenue per acre derived from them is considerably less, because they are being cut down at a young age and a large proportion of timber of [illegible] is [illegible] removed. On the other hand their capital value is less and when they are properly managed they should give a higher rate of interest.

But unfortunately, although there are exceptions to the general rule and some of the private forests are maintained in an excellent condition, it cannot be said that generally speaking they are so. For while coppice or [illegible] simple coppice [illegible] according to the age from the young age at which the crop is cut and removed and in consequence of the comparative frequency with which the ground is exposed tends towards physical deterioration, working plans are rarely prepared and there is [illegible] to guarantee that the cuttings are confined within proper limits. The fellings are in fact too frequently regulated according to the financial requirements of the owner rather than by the considerations which ought to govern such operations, and hence it follows that the management of the private forests is not always so good as could be desired. This is [illegible] and is perhaps especially so in France, where the law [illegible] to the division of the land on the death of its owner and the existence of the [illegible] tend constantly to diminish the number of large properties and to leave in the hands of each proprietor an area of woodland too small to admit of its management on a regular system.

The produce [illegible] from the private forests is however large in amount and of very great value. Exact figures are not obtainable, but it is estimated that the 2[illegible] square miles [illegible] annually over 12 million cubic feet of [illegible] wood [illegible] of firewood, [illegible] tons of oak bark and [illegible] tons of [illegible] produce [illegible] ([illegible]) while the [illegible] three and a half million [illegible] of wood [illegible] ([illegible]). The number of foresters and guards employed in these forests is however comparatively speaking very small, this being due in a great measure to the small size of the [illegible] properties, which are consequently in a very large number of cases managed directly by their owners. There are no private institutions for the training of foresters and woodmen, and although the State forest schools are open to receive free students, very few [illegible] advantage of this privilege. The Nancy school has only trained thirty such students since it was established in 1824 and the [illegible] and primary schools have only received [illegible] between them. Neither the owners nor their managers or guards have then as a rule had any professional education notwithstanding that the means of obtaining it is open to them, and it is not to be wondered at if grave mistakes in the management of their forests are of frequent occurrence. In some places they have the means of getting a certain amount of advice from the State forest officers, who are [illegible]

permitted to render assistance in this manner, but they frequently attempt to imitate what is being done in the State forests, without knowing the reasons for what they see, and they are thus led to commit serious mistakes, as, for example, when, in treating a forest which is to be permanently maintained as coppice under standards, they follow the procedure adopted in a neighboring State forest which is undergoing conversion into high forest. In many cases, of course, the private woods are too distant from the State or communal forests to permit of their owners obtaining any advice or assistance from the officials of the forest department, and they are then thrown entirely on their own resources.

THE TIMBER RESOURCES AND TIMBER TRADE OF CANADA*

From the geographical position of Canada and the United States and the natural and artificial routes of transportation that exist among the line, and across the boundary between them it is reasonable to expect that the interests of trade will in the future as in the past draw from the timber resources of both countries for their respective wants so long as either of them has these commodities to supply. Besides this common interest in the forests for meeting the demand for consumption both countries have for a long period been competitors in the foreign lumber and timber trade and have shared alike in the vicissitudes that have attended it.

It therefore appears proper to present in connection with the statistics already given concerning our foreign commerce in forest products as full information as can be derived from official and trustworthy sources as to the nature and extent of this business in Canada extending back to the date of the present Dominion Government and in some instances to an earlier period. The series of tables that we present will sufficiently represent the tendencies of the trade during the years they embrace and its extent as compared one Province with another and in different years.

The great prominence of the timber interest of Canada has in recent years led to thorough inquiries into the extent of these resources a synopsis of which will be first presented

Inquiries concerning the Timber Interests of Canada.

A Select Standing Committee on Immigration and Colonization appointed by the House of Parliament has at recent sessions thought proper to institute inquiries having reference to the condition of the forests of the country and the extent value and prospects of the lumber trade. The chairman in the session of 1878 (Mr James Trow) in introducing the subject remarked

That the actual condition of the timber supply of the Dominion was a subject of the utmost importance and one that deserved the special attention of the committee. It involved not merely the prosperity of the greatest of the manufacturing industries of the country and the main staple of its foreign commerce but exercised also a controlling influence in regulating the extent of future settlements, in as much as the forests tempered the climate by rendering it more equable maintained the regular flow in rivers by preventing inundations and furnished new settlements with the cheapest building material and fuel

Mr Stewart Thayne an English journalist of some years experience who had for the last five years been engaged in researches having reference to the lumber interest and who had been for two and a half years exclusively engaged in studying this subject of timber resources in Canada, appeared before the committee and gave in substance the following information —

"The advantages which Great Britain derives from the Canadian supply of timber are numerous, the principal being —

1 The best quality of Canadian pine is the most valued of the soft woods used in the United Kingdom.

2 The dimensions of the soft woods shipped from Canada are larger than can be procured from the timber producing countries of Europe

*F. B. Hough: Report upon Forestry (U. S.) 1878-79.

3. The colonial supply maintains a healthy competition in the trade decidedly favorable to the interests of the British consumers.

The trade affords employment for a large amount of British and colonial tonnage.

The kinds of wood exported are among the hard woods oak elm ash, birch etc and of soft woods the white and red pine and spruce.

The dimensions now exported are less than formerly. It was quite usual for the square timber shipped from the St Lawrence about thirty years ago to average from 70 to 75 cubic feet per log whereas at the present day the average of the common log crop does not range beyond 35 cubic feet. Even in regard to the quality it was no uncommon thing at the period last referred to for the crop to yield from 70 to 80 per cent of first quality of wood. I think it would be wrong from the mark to state that the pine at present sent to the Quebec market does not furnish 2 per cent of first quality. About two years ago I took the trouble to ascertain the quantity of the stock remaining at Quebec and the estimate I then found was greater than the one just quoted; indeed the loss in my opinion did not exceed 15 per cent. Perhaps however some allowance should be made for the fact that this stock was that much was left after the season's shipments.

The quantity of timber that passes through the lakes and down the St Lawrence is considerable and I am not disposed to think that it is all of the best quality. The British Board of Trade returns estimate the value of the Canadian wood imported during the year 1857 as amounting to £2,[illegible] and the total imports of hewn timber during the year amounted to [illegible] cubic feet of wood, namely British North America furnishing [illegible] or a little more than one fourth. This included every description of wood but sawn wood. Of sawn wood there was imported during the same period [illegible] feet of which the British colonies supplied [illegible] cubic feet. Several intelligent persons I have met with state that Canada supplies the United Kingdom with one fourth of its timber imports. The total estimated value of these imports, exclusive of furniture wood is set down at £11,[illegible],447 and the value of the Canadian goods at £[illegible],000 sterling. It may be gathered from these figures that a higher value is given to the Canadian timber than to that received from other countries.

In respect to the present timber trade of Canada as compared with that of twenty or forty years ago there is a very great difference in the proportion. For instance in the year 1851 the total importation of hewn wood into Great Britain amounted to [illegible],000 cubic feet and of this quantity [illegible] cubic feet were sent from British North America.

In 1852 1853 1854 and onward up to 1860 Canada annually had their proportion of the total quantity imported to Great Britain greatly increasing, but the exports from this country did not bear the same ratio to the general trade. Thus in the latter year the total importation of hewn wood reached [illegible] cubic feet of which Canada contributed 12,[illegible],447.

The square timber trade of Canada has been severely tried in the long run of market by the change in the tariff having set in fact from a certain duration. The immediate result of the reduction of the duty on foreign wood was to increase the importation of the latter very considerably during the years 1861 1862 1863 and 1864. During these years the exports from Canada increased also but not in the same ratio as the foreign. In 1861 the figures representing the then value of trade are as follows. Total imports of hewn wood [illegible] cubic feet from Canada [illegible] cubic feet sawn wood total [illegible] cubic feet from Canada 21,740,900 cubic feet.

"The following table shows the expansion of the trade in recent years, the quantities being cubic feet:

	Hewn wood.	Sawn wood.
1872 Total imports	89,131,650	154,167,450
From British North America	22,174,200	39,414,400
Percentage from British North America	24 7	25.6
1873 Total imports	103,369,500	170,786,150
From British North America	18,293,750	47,717,800
(Percentage from British North America	17 6	27 9
1874 Total imports	122,869,700	190,263,350
From British North America	23,818,750	53,809,400
(Percentage from British North America)	19.5	28.3
1875 Total imports	84,396,350	164,691,500
From British North America	16,843,350	47,661,400
(Percentage from British North America)	19.9	28.9
1876 Total imports	107,914,750	205,120,900
From British North America	23,527,450	55,367,350
(Percentage from British North America,	21.8	27 0
1877 Total imports	105,980,650	228,637,400
From British North America	24,286,000	62,810,600
Percentage From British North America)	23.3	27 4

"All the timber producing countries of Europe have participated in furnishing these immense supplies of wood; but the most notable increase apparent, during the past few years, has taken place in the quantities of pitch-pine imported from the Southern States. A few years back the demand for this wood in England was limited, being used only for a few special purposes. Immense quantities have been shipped to Europe during the last few years, and, having been sent on speculation it was sold frequently at very low prices, in some cases at rates that did not cover the freight and expenses, hence it has been introduced into many districts where it was formerly unknown and competes with the lower grades of Canadian pine, but more particularly with the red pine.

"Sweden and Norway supplied the United Kingdom with from 4,000,000 to 6,000,000 cubic feet of hewn wood during the last few years more than Canada.

"But a very large proportion of the goods under this heading consists of pit-props, and spars, and other small wood of little value. In the matter of sawn wood, these countries furnish Great Britain with some twenty or twenty-five million cubic feet more than the Dominion. The best Swedish deals do not compete with the best quality of Canadian pine, but find a readier sale than the second and third qualities of the latter.

"This trade must be of great value to the shipping interests of Canada and Great Britain but I have no means of ascertaining the exact number and tonnage

employed in it for a longer period than in almost any other

and finally thronged the woodyards of Liverpool."

therefore that it must be much less than in former years. By quality I mean not the size but the texture of the wood."*

In answer to the question as to why the importation of timber into England from Canada had fallen off it was replied: "I imagine that the reason why the export of square timber from Canada has not kept pace with the home demand, is your inability to supply the description of it that is most particularly wanted. I think also that your profits have diminished because so much of your timber is of poor quality. I think it is safe to contend that the reason why more of your best pine is not purchased is that it cannot be had and I fear that your power of producing it is not likely to flood the home markets.†

"No doubt there is still some excellent timber in Canada. What I have been attempting to explain is that however good the produce of certain sections may be or however well some portion of the present supply may compare with that of former years, still the total quantity of such wood brought to market is small when compared with that of former years, perhaps not one fifth of a season's manufacture."

With respect to the probable duration of timber supply at the present rate of consumption exportation and waste Mr Thayne did not like to give a definite opinion for the following reasons

1 Because he could not find data sufficiently reliable to guide him to a safe conclusion,

2 Any calculation that would ignore the quantity of young timber standing in the woods but which may become available in the course of twenty or thirty years, would rest on an unsound basis; and,

3 because there are so many sections of timber producing land in these Provinces which though not extensive when considered separately still form in the aggregate no mean source of supply and which though now out of sight of water may be opened up provided a profitable demand should spring up. Having made this statement he added: "I feel bound to say that every test I have applied to ascertain the quantity of merchantable timber actually standing in any section of the country has convinced me that the resources available are much smaller than public opinion supposes them particularly those woods adapted to the export trade."

In reply to a question the witness said: No doubt the duration of the timber supply of the United States is a point of much interest to this country. Any interruption of the supplies now drawn by the eastern states from the west would at once compel the former to resort to your markets. Under such circumstances it seems to follow that Canadian lumbermen would seek an outlet nearer home for their produce. It would moreover be easy for the New England dealer to compete with the English buyer here ones, as the latter would always be by a heavy ocean freight."

* To this statement Mr. Cockburn, a member of the committee said: "I must join issue with you on [illegible] are getting to be very few. [illegible] at Quebec [illegible] timber growing in the Province [illegible] very near. [illegible] was supposed to be very [illegible] the [illegible] the [illegible] Another member remarked that I misunderstood the difference in price between first and second rate, as a stage was less than more. It that at present I regard a load not so much to mean as to quality, a small log being sometimes worth more than a large one.

† It was here remarked, by a member that large pines came from Michigan, not 22 inches [illegible] strong and [illegible] that of Canada and were used upon the American [illegible] in grain. But we should bear in mind that these woods, although competing favourably with Michigan timber of the present day, do not compare with the larger timber produced in Canada some years ago. We produced as good a quality of a larger size, fifteen years ago.

With respect to pineries lumbering districts the Ottawa valley so far as the export trade is concerned was by far the most productive the area drained by the Ottawa and its branches being about [illegible] square miles. Over four-fifths of the square timber exported to the United Kingdom is manufactured in this valley

The chairman remarked that altogether the average area of timber lands in the Dominion is about [illegible] square miles. The river Saguenay and St Maurice drain large regions extensively timbered

Great Britain imports masts and spars from Puget Sound and some wood for the boards from Russia but the timber is had there was to the workmanship of furniture manufacturers in London but the cost of freight was great at the same time very considerable importations from that country on a large scale. There is no inducement [illegible] outward freights, a ship fleet and the journey is too long and costly to entice vessels merely for a return cargo

Of the pineries and [illegible] that worth of soft woods imported annually by Great Britain during the years preceding the late war [illegible] was obtained from Canada a few cargoes of spruce and red pine. The French could [illegible] the white pine. This may arise from the fact that the native [illegible] are used very extensively in house and ship construction. Of such a very large quantity enters into consumption in England large shipments being made from the Maritime Provinces

It has been computed that the timber trade of the Ottawa valley alone affords employment to upwards of 25,000 men

In regard to the [illegible] of timber supply in the north of Europe a definite answer could not be given. Russia is credited with a large forest area that might be made available for [illegible]. A [illegible] pineries were [illegible] forest in the centre of Europe which can only be reached by water [illegible]. What [illegible] and at [illegible] at least the expense that such transportation in Europe would involve can only be [illegible] by experience. It is true that the [illegible] are [illegible] a great deal of interest in [illegible] their forests but this new awakening [illegible] the [illegible] [illegible] to provide the exportation of forest products but rather to the fact that they are required at the [illegible] [illegible] consequent on stripping the hills and river banks of their wood

With respect to the waste attending the system of leaving [illegible] by removing the best trees and allowing a large portion of the timber [illegible] it was stated to have been greater formerly than at present the [illegible] [illegible] [illegible] [illegible] as to secure that by [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] great waste in the manufacture of square timber as [illegible] the last part of the tree was cut in the woods in the form of [illegible]. The present system of [illegible] does not present an inducement to waste. At [illegible] when a cent [illegible] was paid for cutting only the finest size of timber [illegible] the trees were cut in the woods at as great an [illegible] as [illegible] to [illegible] the trees were [illegible] by the government at [illegible] feet average and [illegible] feet and the object of the lumberman was consequently to cut stocks as large as he could.

With respect to the [illegible] of forest [illegible] lands the witness replied to an [illegible] touching the [illegible] of the measure as follows

It is [illegible] understood [illegible] steps in this direction have not been taken. In the Provinces of Ontario and Quebec the local governments derive a handsome revenue from the timber lands and yet they seem to regard their [illegible] with perfect indifference. Every tree that is felled contributes to

the Exchequer, still millions have been destroyed by fire without exciting the least effort to prevent such wholesale destruction. These Provinces are spoken of as the future home of millions of people and yet there is no forethought displayed in reserving for their use and enjoyment so necessary a source of building materials and fuel. In these two Provinces there exists an immense area that will never be fit for settlement but which, if judiciously managed, would place Canada in the front rank as a timber producing country, thereby affording constant employment to a large portion of the population and supporting both commerce and all trading interests. I maintain these results to be of paramount necessity to preserve or restore such natural rights as have been acquired, not to adopt very extraordinary or costly expedients.

I have to draw your attention to the long terms on condition of keeping up the roads and restoring the cut-over timber lands, and especially to the first of the remaining provisions. If these lands which have been cleared of timber are left to grow their own timber, the duties of practical foresters in the various countries that would repay the cost of culture. I am aware that the mere mention of forest culture seems something far fetched and impracticable to American ears but that has not been the fact of a large portion of European nations where it is the most profitable. When forests in a country like this it becomes a question of planting a territory not adapted to any other purpose and which otherwise must remain barren and unproductive there should be no hesitation respecting the course to be pursued.

It is admitted very unfortunate that a course of policy which is calculated to stir up some great thing and operation and of which the advantages can scarcely be fully appreciated for one or two generations, is not easy to resist the sympathies of gentlemen but this very reason should be a patriotic statesman to undertake it with determination."

The opinion was expressed that white pine would be as it would scarcely pay to cultivate. By preserving the young trees it may be just for a number of years particularly as there is not much expected that the soil which it occupies will be required for other purposes. It requires something near a hundred and fifty years to attain maturity. It was remarked that of late years experiments made in various countries having widely different climates have established the fact that trees may be successfully grown in regions far removed from their original habitat and can already compare favorably with those of mature growth.

There is therefore no reason why similar results should not be attained in this country.

The Eucalyptus an Australian gum tree was mentioned as an illustration of this fact it has been found to thrive remarkably well in the south of France in Algeria Palestine and California but it would not survive the winters of Canada.

As to the appointment of inspectors of forests to report on the timber and enforce the laws for prevention of forest fires, it is said —

The appointment of such a staff would be one of the most urgent needs of the country the prevention of forest fires. If it were generally understood that the lowest estimate of the average annual loss through the forest fires prevails at Ottawa (and in the Ottawa valley alone it appears to me that probably would much more than suffice to prevent such a heavy waste of the national wealth for it should be remembered that in the great majority of cases these fires originate in causes that could be easily controlled but that the country should derive the fullest benefit from the services of such a corps it is necessary that these inspectors should be practical foresters of high education and ample experience in the best training schools of Europe. It would be comparatively easy to secure the services

of such a scheme who when once established in the country would train their assistants. Officers of this stamp would in the course of a few years be in a position to furnish the government empowering them with such information as would render the management of a forest force a comparatively easy. It may be objected that this plan would involve considerable expense but what would the heaviest outlay under this head amount to after all but an additional premium of insurance against the average annual loss sustained through these fires, leaving all other considerations out of sight."

In the question as to whether it would be deemed arbitrary on the part of government to make it imperative upon the settlers to plant a certain number of trees on their homesteads it was replied: "I would consider such a provision one suggested by ordinary prudence. In the treeless districts these plantations would create a continual supply of fuel and other shelter to the land. And here again the necessity of practical foresters in a forest manner itself apparent. In order that the settler may derive the fullest benefit from the trees thereby to be planted in positions where they would be of most service to the cultivated land I would go even further in suggesting that where new town lots were laid out for settlement the portion to be occupied by the plantations should be selected in such manner as to afford protection to the more exposed districts. The new comer should also be advised as to the description of timber best adapted to the soil, etc."

Returning to the subject of the difficulty of raising wheat the question was raised as to whether it would not be advantageous to replant sections of the country with spruce and other growing timber. The witness said: "Most decidedly. I imagine however that it would be only in rare instances where it would be necessary to incur the expense of planting, regulations providing for the proper protection of the young trees would answer the purpose in view. At the same time the government should offer inducements either to farmers or contractors to devote a small portion of their lands to the cultivation of both native and foreign trees and ascertain from time to time the rate of growth etc. The government should provide either the seeds or saplings upon which the experiments were to be made."

A member remarked that in the eastern counties in ten or fifteen years wood would get to be a good crop but it would take a long time to grow trees from the seed. When cut it is often in a quarter lot there stand ten or fifteen years, and they will yield good cutting timber.

Spruce is used in England to a very large extent. The Maritime Provinces, the Lake ports and the shores of the St. Lawrence ship a very large amount. Norway is the principal source of the [illegible] but it is a very small [illegible] spruce which is used in Canada as [illegible] Sweden.

A considerable portion of the trade between the ports of Europe and Great Britain is in the shape of manufactured goods, flooring, [illegible] mouldings, frames etc. There are many articles of the sort specially prepared for the trade with respect to Canada. In the first place these manufactured goods imported from the north of Europe are [illegible] in the construction of the [illegible] and of factories, warehouses etc. These manufactures are cheap, which for them can be specially executed and can be forwarded with despatch at a moderate rate of freight to all the principal ports of Great Britain, such as are consigned for sale are also sold at very low prices, labor being cheap in those countries and the machinery to the contrary. On the other hand the builders of first class houses in which Canadian timber is principally used have their orders carried out under their own supervision and were it [illegible] the time necessary to forward orders the delay that might attend their execution to

[illegible] of the ports and places at the [illegible] of open navigation [illegible] many [illegible] of the Canadian manufacturer.

It might be added to the foregoing that English [illegible] of the [illegible] are not constructed with so much uniformity of size as they are on this side of the Atlantic. An [illegible] firm [illegible] sufficient [illegible] of [illegible] a depot for the sale of its goods and forwarding a [illegible] of stock during the summer season [illegible] in [illegible] Europe [illegible] in the trade [illegible] to [illegible] of large [illegible]. [illegible] it would be necessary to [illegible] and an intimate acquaintance with the [illegible] of English [illegible] operations.

As to [illegible] it was thought that when pine becomes more scarce and [illegible]. If [illegible] were as well known in Europe as in the United States it would [illegible] for the flooring of large warehouses, particularly where grain is stored.

In respect to [illegible] Europe [illegible] from [illegible] this country. [illegible] as they are here. [illegible] parts of [illegible] there are [illegible] villages scattered through them. Most of the inhabitants of these villages are employed in the forests [illegible]. Every forest of any extent has its regular staff of [illegible] whose [illegible] it is to watch over [illegible] and [illegible] up to prevent fire from spreading. The ground is not encumbered with such [illegible] as is seen in this country. There are no [illegible] the [illegible]. The people [illegible] are interested in their preservation [illegible] occur. Now that [illegible] of late years they are [illegible]. Formerly very few fires [illegible] accompanied by heavy [illegible] and of a [illegible]. In [illegible] in tracing two great fires in the Ottawa Valley to lightning, but they occurred some time ago."

The question of the influence of forests upon the climate of the country and of the effect of clearings [illegible]. Mr. [illegible] replies: "I have endeavoured [illegible] upon this point, but without results that would enable me to form a [illegible] opinion. [illegible] observations [illegible] have been [illegible] far from the influence of forests to [illegible] but the most [illegible] changes [illegible] the comparatively short period that the country has been under [illegible]. [illegible] be [illegible] at [illegible] points scattered over a wide area. I [illegible] that the [illegible] made by the settlers and [illegible] by the forest fires must [illegible] a certain amount of influence on the climate of this portion of the Ottawa Valley, but the [illegible] of any observations [illegible] this point renders it impossible to express any opinion on the subject."

The effect of [illegible] upon the prairies being referred to, its importance was urged in the strongest terms. In the various accounts I have read of the prairie land of the North-west I find frequent mention of the sudden changes of temperature. Severe frosts occur sometimes after the crops have been sown and again before they have been reaped, or the temperature of the night is often much lower than that of the day. Then these plains are exposed to violent tempests through the cold currents of the Arctic regions coming into contact

with the heated ones of the plains. To accumulate a climate preventing such contrasts there is only one method: that of planting wherever the nature of soil will permit it and forming the settlements under the shelter of these plantations. Of great importance is this to our western country that in no question upon its western depends whether that region will realize the extravagant anticipations entertained of its being able to support an immense population; or whether, after many disappointments perhaps it will deserve the name of the Lone Land. It matters comparatively little if the earth have been removed to the mountains or stones wrought to destruction of their material; I think it unreasonable to fear that a country covered to a quarter of its area with trees will not be productive when instead of being vigorously planted it already contains stock of timber sufficient for further encroachment upon by the new settlers.

The experts being asked as to whether a reduction in the amount of exports would tend to enhance prices and thus bring increased profits to the lumbermen, the opinion was expressed that any further restriction in the export of the first quality of pine would make it necessary that its use should be restricted to a few markets. A big mast or a spar could be sold for a high price in many quarters where a pine board could not be sold for a low one. The best means of preventing fluctuations in the market would be to export a little less than experience had proved to be a fair average demand. So long as lumbermen manufactured in advance of every new call, and regulated the rate of exports they must take the chances as to the prices which their goods will fetch in the foreign markets.

With regard to the demand of timber for ship building a tendency had been observed to waste in the making, owing to being squared by hand instead of by steam, as the carriage of an inch of sawdust and three inches of shavings.

In reference to some remarks on the number and long training of Prince Edward Island shipbuilders, it was stated: We export some of our ship builders now in addition to lumbermen, etc. from Quebec. They are good pine and timber. We have evidence of a class not about the same as our timber cruisers formerly. We can name from seven to nine years. We can produce in Prince Edward Island as clean pine timber as in Quebec. We find that wooden ships are taking the place of iron ships and we have a great advantage from the fact."

In a report of a similar committee upon the extent and colonization made in 1875 in considering the capabilities and prospects of the north western regions of the Dominion of Canada, the following answer was given by Mr. Ivens to the question as to how the present growth of wood might be maintained so as to prevent its exhaustion:

"In a system very different to the one pursued in the older Provinces of the Dominion where the forest lands have been treated without the regard either for present purposes or for the future wants of the country. Here however the opinion was universal that the timber was to be cut and that its destruction was advantageous to the country. It seems of late years that the fallacy of this idea has been brought home to the minds of those who have examined the matter. In the North west the case is very different to older settlement authority exists to maintain that the timber supply is ample to the wants of such a population as the fertile lands might be expected to support. The obvious policy of the government would therefore be to have the timber pertaining regions surveyed at the earliest date before any vested interests are created and set apart permanent reserves wherever the settlement may require shelter or where a large population is likely to settle. These reserves should be under the forest control of the government who might at time when they are ripe to the axe find that the means should maintain a regular supply or better st

the signal for measures of a far more stringent character

available by railways is very large while others assert that in these comparatively unknown districts the quantity of timber merchantable timber is very limited. What may be taken for granted is that while the area under wood suffers no perceptible decrease the requirements of the home and foreign markets are augmenting in a ratio far beyond the productive power of the soil.

In reply to inquiry as to how the government can promote forest culture in the North-west this witness replied:

"In my opinion their first duty is to ascertain the exact nature and extent of the timber country in the wooded region and this can be effected only by an exhaustive survey. It would then be possible to determine the area that should be set apart for the support of a permanent forest growth due consideration being given to the nature of the climate the condition of the river and other water courses and the wants present and prospective of the population which the area can support. It would then be in order to reserve certain tracts for the growth of timber in the most fertile portions of the prairie lands. Certain natural attributes should be selected to establish reserves for the protection of river courses or to act as wind breaks. In many instances these should be compelled to plant and the waste lands belonging to the municipal bodies or trustees should be under a similar obligation wherever a belt of wood or shrub will serve to improve traffic or endanger the climate, others should be encouraged to plant trees for shade and shelter. It would be premature to suppose that this system of forest preservation and extension would entail a burden on the exchequer. The forest lands in the actual possession of the government may by judicious management be made to yield a large revenue beyond their expenses and a portion of this revenue spent in planting the new reserves would in course of time become in such a country the most profitable of investments."

The possibility of raising a second crop of timber in any area where it has been consumed by fire being a subject of inquiry no definite opinion could be expressed. The only experience in Canada was that if nature left to her own resources. What might be done by artificial culture is doubtful as no experiments had been made. It was indeed evident that the conclusions arrived from forest trees had been examined and reported upon by persons of sufficient authority to have any weight attached to their opinions. This much was certain that wherever a fire ravaged a pine district the new growth was of a totally different species and on hard woods the result was similar. When fire runs among the pine reflection destroys the vegetative power wherever the bark is burnt covered but when it is confined to the branches and trunks numbers may be seen why the same species might not be grown. It was feared that the pine would never get to maturity in Canada. At a small outlay the Crown Lands Department might easily ascertain what species of timber can succeed in planting lands and settle this and many other points of no small moment not only to forest science, but to the whole community.

In the renewal of supplies in Norway and Sweden up to a very recent date the natural growth has been depended upon to replace the timber used for commercial purposes and that too only in the old settled districts. Of late years however the growing scarcity of wood has induced many Norwegian merchants to purchase cheaper and partially exhausted woodlands and attempt planting on a large scale and this movement is extending. Something similar has been undertaken in Sweden by the same class as also by the iron manufacturers who are at the same time owners of extensive forests. The impression seems to be gaining ground in both countries that the present rate of consumption cannot be maintained unless steps are taken to assist the efforts of nature. Were the govern-

ments of those countries to introduce measures for the promotion of timber culture they would not be under the disagreeable necessity of imposing restrictions that operate frequently to the disadvantage of trade. There is no fact better proved than the one that capital invested in the cultivation of timber yields immense returns.

It is claimed that the area under forests in Sweden amounts to 150,000 square miles, and in Norway to 50,000 square miles. Competent judges are of opinion that in the former country less than one half, or about 60,000,000 acres, represent the total quantity of land bearing merchantable timber, an area not larger than that which the Province of Quebec might set apart for the production of timber without encroaching on lands adapted to agricultural purposes. In the other Provinces of the Dominion there is an extent of forest territory far greater than there is in the north of Europe, if we except Russia.

Other Statements Concerning the Forest Resources of Canada

The annual reports of the Montreal Board of Trade and Corn Association, in giving statements of the dealings in forest products from year to year have repeatedly called attention to the great and needless waste that was continually going on, and have suggested the propriety of enforcing regulations to enforce economy in timbering operations. The custom of levying dues upon logs by number, without reference to quality, naturally leads the lumberman to select only the best, leaving the poorer grades to rot in the woods. But if these dues were imposed on the basis of quality an expensive system of inspection in the woods would be involved, and it has been suggested that the most satisfactory means of effecting the object would be by an ad valorem rate on the timber sawed and exported, as could be best done by the Customs Department.

It has been further suggested that rigorous measures should be devised and enforced with the view of preventing the vast damages annually done by forest fires, and that inducement should be offered for information that should lead to the punishment of those originating them, whether wantonly or by accident. Such a fire may have been set by a stray hunter or fisherman bent on sport or by the clearing of some pioneer far in advance of the frontier settlement, or as is often the case by some of the lumbermen's employees, who, troubled by the dues on the banks of a stream, may have known a fire to secure protection from their tormentors which the smoke affords. The remedy against these acts of carelessness or malice must be found in adequate penalties rigidly enforced and of such degree as to render it certain that due care shall be taken in the handling of fires in the woods.

With respect to the rate of reproduction of woodlands and the measures that deserve attention in securing that end, the reports in former years offer the following statements and opinions:

To obtain an idea of the regular increase in the value of growing timber it may be supposed that it grows one quarter of an inch in diameter yearly, which is not over the mark, and as the trees cut will average about twenty inches in diameter the increase in size will therefore be about seven and a half feet per log board measure, or over three and a half per cent. If to this three and a half per cent. be added to the same cost by over production an idea of the soundness of such a policy may be had. It is quite certain that as timber gets cut away and becomes scarce prices will rise, and that the lumberers of the present generation are actually killing the hen that would, if properly treated, continue to lay golden eggs.

"Government would deserve the praise of the future inhabitants of the country if they would organize a scheme for planting with young timber trees the [illegible] wastes of the Province of Quebec. Such an investment would certainly not pay a dividend to this generation, but it would [illegible] when the present trees are all cut and would be a source of wealth to those who possess it when the timber becomes large enough to be merchantable. By maintaining a [illegible] system of planting [illegible] might be [illegible]. As it is the forests are [illegible] of all their valuable timber and comparatively nothing grows up to supply its place. A very large portion of the country north of the Ottawa is unfit for farming and never can be [illegible] made fit for grain growing or pasturage, but it is [illegible] suited for the growth of timber, and even a modest experiment would soon [illegible] the great results likely to accrue. The cost would be small, there being many large tracts [illegible] by repeated fires that there is nothing [illegible]. The expense would be [illegible] the cost of the [illegible] planting, and that would not be much [illegible] where the plants would be set out. The whole arrangement would of course require to be planned by a practical man and properly carried out, and such being the case there need be no fear of the result. What is here suggested can be done and must yet be accomplished, and he who does it will be a greater benefactor to Canada than any of the statesmen of the present day."

An [illegible] traveller after [illegible] of wood [illegible] in passing through the [illegible] parts of Canada, and the same remark [illegible] the [illegible] States [illegible] of these forests in meeting the demands of commerce [illegible]

It [illegible]

[illegible]

to travel miles after miles with your view narrowly closed upon either side by flat, unrelieved unbroken woods, of ungainly and half developed trees, is a thing far more wearying to the sight than even a journey over the bare wilderness of the prairie. Then whenever the continuousness of thick woods is broken, it is apt to give place to something not more cheerful. Here you come into the clearing made by some recent fire, where the crowd of living and struggling trees has been burned into a few bare blackened poles, standing in their gaunt straightliness the ghosts of their former selves, with other blackened logs and branches lying strewn over the scorched ground. Again you plunge into the forest, and see it as it makes itself without the ordering hand of man—now dense and now thin—trees of different kinds not generally herded together in intermixture, but standing apart as nature has sorted them, and as in the great struggle for existence every kind custed from elsewhere has been forced into the station best fitted for its support. trees of all ages fighting together for bare life, some vigorous and freshly green and feathered down to the very ground, some weakly and faded and only flinging out here and there ragged and unbalanced branches, some that are mere dead corpses and have fallen as dirt out of their places bruising and breaking the living, some that with their lower branches all torn and maimed, have yet stretched up out of the throng and seem as if straining all the life within them to peer over the heads of their fellows and catch glimpses of how the fire their deadliest enemy is spreading havoc nearer and nearer. Again you are once more in open ground is lately cleared by some settler who has ploughed and sown among the tree stumps, those broken columns of the forest ruin, fenced in his clearing with the rude zig zag wall of logs, the universal snake-fence of the country. built up his log hut in the midst and set himself to that task which takes half the lifetime of a man to carry out the turning of forest land into a farm. After many hours of such a journey and after many days of similar journeyings, the English traveller will not find himself thinking less fondly of the more smiling landscape at home."*

The Waste in Working Square Timber. Economies in the Timber Trade.

Concerning the great waste from the preparation of hewn timber as heretofore practised, the Commissioner of Crown Lands for the Province of Ontario in his report for the year 1879, says:—

"The great loss sustained yearly by the Province and the revenue from waste of valuable material in the manufacture of square and waney pine especially in connection with the former which is hewn to a "proud edge," has for some time occupied my serious attention. It is estimated on good grounds that one fourth of every tree cut down to be made into square or waney timber is lost to the wealth of the country and that the revenue suffers proportionately. When the tree is cut down it is lined off for squaring and the "round" outside of the lines is what is called *boxed* off on the four sides. the wood thus beaten or slashed off in preparation for hewing by the broadaxe is the prime part of the tree from which the best class of clear lumber is obtained when the timber is taken in the round to a saw mill. Besides the destruction of timber of the finest texture and greatest value there is the upper portion of the tree, near to and partly into the top, which would yield lumber of an inferior quality, it is true,

* Sketches from America, by John White, Fellow of Queen's College (1879), p. 166.

but suitable either for domestic use or for export to the American market where during general business prosperity large quantities of the lower grades of timber are required for packing and other purposes connected with trade of an kinds as much as [illegible] feet it is stated being sent annually by two or three firms to Boston and New York to be used as boxes for packages of petroleum among but the upper part of the tree is reported by the square timber manufacturer and left in the woods with the fine wood broken off it rot and become material for feeding forest fires by which more timber has been destroyed than has ever been cut down for commercial purposes.

"The following will show the net value to the Province and the revenue from waste in getting out square pine from 1868 to 1877 both inclusive. The quantity taken from public and private lands during these years [illegible] cubic feet waste on each tree equal to one third of the total measurement viz [illegible] cubic feet or say in round numbers [illegible] feet board measure which may be valued on the stump at $1.00 per 1000 feet and one half of this per 1000 feet representing the value of the pine timber broken off and the inferior timber from the upper part of the tree average value say $7.00 per 1000 feet would be $[illegible] for the ten years or an annual loss in material wealth of $357,750

"The quantity taken from public lands during the ten years is [illegible] cubic feet the waste on which on the basis given being equal to [illegible] cubic feet or [illegible] board measure subject to Crown dues at $1.00 per 1000 feet would be $[illegible] or at the revenue during the ten years or at the rate of $26,250 per annum."

"The loss to the country and revenue from timber destroyed by fires which might have been confined to a limited area and sometimes extinguished before great damage had been done to the forest but there not been felled by the axes of trees left to rot and dry, is incalculable.

"In 1877 I instructed the officer in charge of the waste and forests branch of the department to prepare a paper on the waste of timber referred to for the purpose of submitting it to the department of Crown lands of Quebec with the view of joint action by the two Provinces to the improvement of the further continuance of the square timber trade.

"On addressing himself to the task he found that the lack of knowledge of the mode of dealing with the square timber after its arrival in the old country in the square "log" was a great drawback in getting information on the subject as it was essential to know how the timber was dispersed at the great centres of import such as Liverpool London Glasgow etc who the parties were who got made and carried the handling of it where it was cut up specification &c to meet the wants of those who put the produce of the saws after this had been reduced to the required measurements specified so that the department might be in possession of facts more or less important when it undertook to show those who are engaged in the trade in Canada that in a measure at any rate, and thereby stopping the export of square timber they would create a market for their materials on the other side of the Atlantic in the shape of sawn timber

[illegible] with proper care, be saved.

utilized

penniless and often in debt when they return to the woods."

commodities to export

furnishing what is wanted.

preliminary step would seem to be for a few saw-mill proprietors to join together and send to the old country two or three practical men having a thorough knowledge of lumbering the different qualities of lumber produced in Canada, and the manner of the working of saw mills who might be accompanied by one or two joiners or house carpenters to make technical observations as to the various uses and forms in which the lumber is applied. Let these parties visit the larger saw mills in England, Ireland and Scotland and on the continent if deemed expedient with sufficient time allowed to inspect and report on the whole subject to their employers having special view the required dimensions of boards and deal stuff in all forms which would suit the several markets and also make inquiry as to freights, insurance, port charges etc. and upon such report, and after due consideration the parties interested would be in a position to come to a conclusion whether or not a fair paying business could be pushed in the direction indicated. The attempt seems to be worth making, and if prepared assortments of Canadian lumber were exhibited in the principal markets of the old country even although they may not take at first, which perhaps would be too much to expect, there is at least a prospect of success through the exercise of sound judgment, patience, and perseverance."

Exportation of Forest Production of Canada

From the earliest period of colonial trade the export of timber has been an important item of production for the British market and much of the timber exported from the northern frontier of the United States has been shipped from Quebec having generally rafted down the rapids of the St. Lawrence and placed upon vessels at Quebec. In later years the timber of the country bordering upon the upper lakes was brought in vessels to Clayton N.Y. or to the head of Wolfe Island or to Garden Island near Kingston at which places for a long period, the principal business of making up rafts for the navigation of the rapids has been done. More recently the business of Clayton has much declined, while that of Wolfe Island and of Garden Island has increased.

The exportation of timber has been largely affected by the tariffs which from political and financial reasons the British Government thought proper to impose.

From the report of a select committee of the House of Lords appointed in 1820 to inquire into the means of extending and securing the foreign trade of the country we learn that the encouragement afforded to the importation of wood from the British Colonies in North America by the imposition of heavy duties on wood from foreign States was of comparatively recent date and that it had not formed a part of the commercial or colonial policy of the country before the then recent European wars. In 1809 little or no duty had been imposed upon the various species of timber but in that and the succeeding year however the nature of the political relations with the Baltic powers led to an apprehension that great difficulty might be found in deriving the usual supplies of timber from that quarter not only for domestic use but more particularly for the purposes of ship building. The Canadian timber trade had not then been large in the aggregate, although relatively important to the country. There being some risk and uncertainty in a further expansion of the business it was deemed expedient to give Canadian timber the benefit of an exemption from all duties

on such as was fit for naval use and a duty little more than nominal on other descriptions, while at the same time a considerable increase was made in the duty on wood from the north of Europe

"High permanent duties and a temporary war duty were accordingly imposed upon all descriptions of wood imported from foreign countries."

The Canadian merchants were never led to believe by the Government that these duties were to be permanent but an expectation was held out that the duty of £2 1s first imposed would be continued for some considerable time No such expectation was fairly raised with respect to the war duty and the duty imposed in 1813 and the exemptions from duty on Canadian timber had always been temporary, and were limited to July 1820†

The protection thus begun was continued many years and the two great monopolies of corn and timber the first maintained for the assumed benefit of the possessors of land the second conceded to the clamour of a certain class of ship owners became through after years the object of attack by an energetic class of reformers representing the more numerous but less organized class of consumers, until their efforts were finally crowned with success After successive reductions from time to time the rates on timber from every country were reduced about 1859 to the uniform rate of 1s per ton, and not long afterwards they were taken off altogether

The following tables are derived from the reports upon Trade and Navigation reported annually by the Master of Customs since the beginning of the Dominion Government, July 1 1867 and previously by the Receiver-General of Canada The division of years will be understood to be calendar years until the change in 1868 when the fiscal year beginning July 1 was substituted

49 Geo III c 86 These were doubled by the 3 Geo III c 77 and afterwards partly remitted by the 5 Geo III c 39 and by the 11 Geo III c 17 and a duty of 10 per cent was imposed on the previous duties were altered by the 33 Geo III c 13 The several duties and preferences were all rearranged and consolidated by the 43 Geo III c 52

The duty on masts, yards, etc., of the dimensions which at the beginning of the wars in the early part of the century had been found to be wanted by the navy was raised by successive steps to 20s 6d in 1805 to £1 and in 1811 further advanced to £2 1s which has been the duty ever since Masts of smaller dimensions were admitted free of duty up to 1786 was then converted to a duty of 4 per cent ad valorem From 1811 to 1821 the ad valorem rate was changed several times, the duty of about 6s 6d and in the latter year this was removed In 1821 in consequence of the report of the committee of the House of Lords, above cited the system was changed by reducing the rate on European timber while that from the colonies was made 10s In 1842 Is 6d per load was added to them respectively In October 1843 the duties were reduced to 2s per load on foreign timber, and 1s per load on that from British colonies See R Porter's *Progress of the Nation* 1847, p. 380

† *Parliamentary Papers*, 1830, vol. 3. (269), p. 4.

Comparison of the Several Classes of Forest Products Exported from the Province of Canada During the Twelve years Preceding the Formation of the Dominion Government

(Quantities and Values.)

Years.	Ash.		Birch		Elm.		Maple.	
	Tons.	Value.	Tons.	Value.	Tons.	Value.	Tons.	Value.
1856	2,589	$14,403	4,556	$40,300	36,453	$503,433	18	$169
1857	3,485	25,360	5,026	46,985	37,984	432,822	169	1,593
1858	2,878	16,999	4,005	30,339	19,461	168,389	37	285
1859	4,313	24,067	937	56,294	26,278	260,840	84	728
1860	2,478	14,976	12,508	100,759	25,629	207,297	349	1,996
1861	2,422	12,708	8,397	60,583	32,610	265,562	127	1,014
1862	2,496	12,770	4,159	32,424	27 689	202,573	139	882
1863	3,241	42,255	11,256	89,111	53,392	421,180	440	2,620
1864*	1,319	6 667	3,315	26,413	14.331	114,414	53	366
1865+	3,670	22,589	10,488	82,638	49,048	387,655	110	1,350
1866+	2,860	20,986	8,793	72,505	29,483	255,670	152	1,258
1867+	3,651	26,074	9,394	81,355	28,476	252,647	76	648

* Half year ending June 30. + Year ending June 30. Since 1864.

Years.	Oak.		White pine.		Red pine.		Tamarack.	
	Tons.	Value.	Tons.	Value.	Tons.	Value.	Tons.	Value.
1856	33,614	$277,190	361,046	$2,062,009	61,943	$471,691	2,117	$13,381
1857	46,539	676,630	500,781	3,821,320	61,323	626,458	4,571	28,471
1858	26,904	377.561	344,981	1,811,340	53,143	374,079	995	5,411
1859	34,300	359,731	395,624	2,249,006	43,643	363,567	3,135	11.382
1860	41,559	404,361	490,296	2,582,605	62,573	507,610	2,589	17 023
1861	55,979	526,997	523,112	2,594,388	71,381	508,609	1,862	11,116
1862	47,436	527,317	480,257	2,110,046	66,563	452,113	14,861	33,301
1863	73,337	754.328	650,423	3,304,902	103,329	745,642	19,591	124,955
1864*	28,337	205,546	194,822	918,323	32,656	230,831	5,326	34,994
1865+	118,313	1,089,417	606,800	2,963,534	108,977	761,037	10,661	65,392
1866+	64,026	710,861	450,960	2,324,063	85,638	593,134	11,266	71,938
1867+	62,395	596,461	413,096	2,118,754	78,792	499,858	5,411	36,015

* Half-year ending June 30. + Year ending June 30. Since 1864.

Exports to Great Britain*

The timber trade of British North America is principally concentrated within the Provinces of Nova Scotia and New Brunswick, and throughout the St. Lawrence and Ottawa River basins, and north-western Ontario.

Up to about the year 1842—and partially afterwards—a very much lower duty was levied in Great Britain on wood which was the produce of Canada than on similar imports from European nations. This led to the fostering of a very large trade, especially in hewn timber, from Quebec and the lower ports on the St. Lawrence—a region which forty or fifty years ago was looked upon as Great Britain's principal source of supply. Large quantities of white pine and spruce as well as a small supply of red pine are still exported, the first being partly hewn and partly sawn, while the second is mostly in a sawn condition. A considerable quantity of oak, elm, ash and birch is likewise exported.

The following return of shipments will best show the movements of the Quebec export trade for the nine years ending with 1882.

In	1874,	854	timber carrying vessels of	636,672	tons cleared out.
"	1875,	642	" "	478,441	" "
	1876,	786	" "	624,110	" "
"	1877,	796	" "	670,620	" "
"	1878,	476	" "	399,833	" "
"	1879,	433	" "	364,628	" "
"	1880,	634	" "	555,451	" "
"	1881,	459	" "	380,186	" "
"	1882,	426	" "	359,925	" "

Small parcels of sawn wood are shipped by steamer from Quebec, and these are not included in the above table, but such supplies although considerably larger than they were some years ago, are not sufficient to alter the fact that this export trade of Quebec is declining.

The following is a detailed statement in loads of the principal items of which that export was composed for the five years mentioned, namely —

	1879	1880	1881	1882	1883
Hewn wood:					
Square and waney pine	106,009	231,051	182,038	168,243	208,540
Red pine	16,276	28,864	18,440	20,494	20,979
Oak	33,620	46,337	37,887	39,147	42,658
Elm	10,880	20,836	15,943	15,557	14,796
Birch	3,929	11,177	5,878	42,274	4,661
Sawn wood					
Pine deals	122,602	266,900	177,659	144,315	183,016
Spruce deals	130,740	147,673	141,962	127,752	125,108

There are no means of ascertaining the exact amount of the Quebec shipments to the United Kingdom, but it is probably about five-sixths of the whole quantity despatched over sea. The total export of Quebec wood to Europe

*Robert Carrick, *Gefle, Sweden*, in Forestry and Forest Products (Edinburgh), 1884.

in 1883 had an approximate value of $7,802,550. A small but increasing business is likewise now being done with South America.

The city of Ottawa is the head-quarters of the timber manufacturing interest of Canada. The wood goods sawn here are principally pine boards for the United States market and it is no exaggeration to say that the Ottawa valley produces of sawn timber is at present the largest in the world. This reached a total of about 1,200,000 loads in 1882. Such a production far exceeds that of any district in Europe.

New Brunswick and Nova Scotia however must for the present be regarded as the seats par excellence of Great Britain's supply of American spruce. The chief ports that are engaged in shipping this class of goods are St. John, Miramichi, Dalhousie, Restigouche and Bathurst the bulk being despatched from the two first named.

In connection with this question it is necessary to consider whether the Dominion of Canada can keep up or increase her present output without endangering the future of her forests and what proportion of that output will be required at home and in the United States.

In seeking an answer to these queries only white pine red pine and spruce need be considered seeing that the quantities of oak elm birch and ash now being exported, are comparatively small.

So far as red pine timber is concerned the supply has gradually diminished to a quarter of what it was in 1867. A substitute for it has been found in pitch pine, so that it is not much missed.

Hewn and sawn white pine is a most valuable description of timber and when of the finest grades is unrivalled for many purposes such as house building and all other wood work. It has been largely and continuously imported into the United Kingdom for more than 150 years and a fully equivalent substitute will be difficult to find. The White Sea redwood alone comes nearest to it in point of quality but the latter in addition to its smaller dimensions and greater knottiness has ever been found to vary in comparison with the former.

The quantity of hewn white pine received at Quebec in 1876 was about 1,024,713 cubic feet whereas in 1881 it was but 111,957,000 feet or taking the average for the years 1871 to 1875 inclusive it exceeded 1,000,000 cubic feet per annum while for the five years 1877 to 1881 inclusive it was but 848,264 cubic feet. On the other hand the supply of white pine sawn to Quebec has not decreased in so pronounced a manner, for although in 1876 it reached 278,363 loads, and only 147,979 loads in 1883, the average of the five years ending 1876 was 247,187 loads against 238,731 loads as an average for the five years ending with 1881. Such figures in connection with the history of the timber exported of late years bear abundant evidence to the fact that a diminished quantity is available for export to Europe.

Reference may be made to the attempt which was made in connection with the tenth census of the United States to ascertain the quantity of mature white pine then existing in that country and ready for the axe. But one Sargent who had charge of this part of the census reported in 1882 in these words: "The entire supply of white pine growing in the United States and ready for the axe does not to-day greatly if at all exceed 100,000,000 feet and the estimate includes the small and inferior trees which a few years ago would not have been considered worth counting. The annual production of this timber is not far from 1,000,000,000 feet and the demand is constantly and rapidly increasing."

According to this same authority's statement there was some years ago only about eight years supply and now there is supposed to be only six or seven

largely why people are afraid to stake their money in the business.

woodlands pay?

the ease, rapidity and spontaneous manner in which this tree reproduces itself. Unlike white pine, which requires a century to grow a standard log, spruce is almost irrepressible, and a spruce forest from which all the trees measuring twelve inches and upwards in diameter have been taken, will after a rest of two decades, be ready for work again.

It does not appear that any systematic attempt has been made by the authorities to reduce to figures the available quantity of mature spruce now growing in New Brunswick, Nova Scotia, and the immense forest belt which lies between the Ottawa river basin in the west and Mingan in the east. All these districts, however, according to Mr Joly, late Premier of the Province of Quebec, contain immense quantities of spruce.*

The following tables exhibit the total number of pieces of squared white and red pine and other woods, and of pine saw logs cut in the upper Ottawa territories of Quebec and Ontario, on Crown lands, and also on private lands from 1826 to 1881 (30th June) inclusive, that is before and since Confederation as closely as can be learned from the records of the Crown Timber Office, Ottawa.†

From 1826 to 1866 Inclusive.

	Square timber.		Pine saw-logs (only).	
	Ontario.	Quebec.	Ontario.	Quebec.
White pine	3,048,382	1,739,094	4,084,358	2,230,056
Red pine	1,714,412	978,064		
Other wood	255,950	146,019		
Totals	5,018,744	2,863,177	4,084,258	2,230,056
Deduct from private lands	1,074,418	612,931	874,349	498,804
Cut on Crown lands	3,944,326	1,751,246	3,209,909	1,731,352

*The pitch pine referred to in this chapter is the *Pinus Australis* of Michaux, otherwise the Southern Pine, the trade in which has been entirely developed during the last twenty years. Its importation to Great Britain is extending rapidly. It is shipped from the so-called Pitch Pine States, situated to the east of the Mississippi River, namely, the Carolinas, Georgia, Florida, Alabama, and Mississippi.

The wood of the pitch pine tree is the heaviest of the pine family, and, like all high resinous woods, is supposed to possess great durability in climates of moderate severity. A very large industry has been developed in the Southern States in connection with the gathering of its resinous products, such as tar, turpentine, pitch, and the like. Turpentine is the raw sap of the tree, and the "boxing" or tapping necessary to collect this is supposed by some to be injurious to the "alburnum" or sapwood, although it has probably little effect on the heartwood, or "duramen."

†A. J. Russell, Crown Timber Agent, Ottawa, in Reports on the Forests of Canada, London, England 1885.

From 1867 to 1881 Inclusive.

	Square timber.		Pine saw-logs (only).	
	Ontario.	Quebec.	Ontario.	Quebec.
White pine	1,926,247	1,119,382	17,920,850	17,277,103
Red pine	483,141	113,626		
Other wood	238,874	68,319		
Totals	2,649,262	1,301,327	17,920,850	17,277,103
Deduct from private lands	615,879	244,895	3,380,275	2,679,412
Crown timber	2,033,383	1,056,432	14,540,575	14,597,691

Total Recorded Product, Upper Ottawa Agency, 1826 to 1881, 30th June

Ontario,	7,173,182	pieces pine,	494,824	other woods,	22,005,108	saw logs.
Quebec	3,955,166	" "	209,338	"	19,507,159	"
Total,	11,128,348	" "	704,162	"	41,512,267	"

In the foregoing table it is to be observed that square timber and saw-logs only are included, and all other wood goods are omitted, as unimportant for the object of the table. The dues accrued from them are, however included in the following equally brief exhibit of the revenue accrued from Crown timber dues in the upper Ottawa territories of Quebec and Ontario respectively from 1826 to 1881 inclusive, being from the remotest period of which there are any records in the Crown Timber Office, Ottawa.

Period.	Ontario.	Quebec.	Totals.	Years.
1826 to 1834	$ 169,078	$ 46,023	$ 215,101	9
1835 to 1851	934,735 55/100	460,643 72/100	1,395,379 27/100	17
1852 to 1857	463,053 42/100	282,579 33/100	735,937 75/100	6
1858 to 1866	896,096 47/100	609,861 53/100	1,505,957 45/100	9
1867 to 1881	3,279,538 32/100	3,439,332 68/100	6,719,371 00/100	15
1826 to 1881	$5,732,506 47/100	$4,839,240 53/100	$10,571,746 55/100	56

The collection of timber and slide dues being combined greatly facilitates and tends to secure the accurate collection of both. The same timber and the same men are dealt with at the same time. The returns of the timber rangers of their inspections supported by sworn statements of cullers, afford the means of effectively checking the accuracy of the certificates the lumberers give the deputy slide masters, which through careless error or fraud might be quite erroneous, as to the numbers of saw logs especially, and as to where they came

from. On the other hand, the assistance the Dominion Officers of Inland Revenue and Customs and their collectors of canal dues are authorized to render at the request of the Crown timber agent in preventing the departure of vessels or the passage of barges loaded with lumber through canals is often of the greatest importance in securing the payment of timber dues. On the River Ottawa no boats or barges loaded with timber are allowed to pass through the canals without permits from the Crown timber agent. Such permits are occasionally withheld for the enforcement of the payment of timber dues and the detention of the boats thus pressed by direction of the Crown timber agent is always promptly effected by the officers of the Dominion.

The Public Timber Lands of Canada—Crown Lands.*

These lands belong to the Provincial governments within which they lie with the exception of those in the North West Territories and the Province of Manitoba which belong to the Dominion government. In Quebec and Ontario these lands are in charge of a Commissioner of Crown Lands; in New Brunswick, of the Surveyor General; in Nova Scotia of the Attorney General; and in British Columbia, of the Chief Commissioner of Lands and Works.

It will be seen that hitherto almost no attention has been given in Canada to the reproduction of timber upon lands from which it has once been cut off, but all the laws and regulations that have been established have reference only to the native forests of the country and to the securing of a revenue from the existing supply. The preservation of young timber too small for profitable use by the limitation of a size below which it should not be cut has received attention only in the Province of Quebec and only in respect to pine timber. Questions of conservation and restoration are however beginning to attract notice, as will be seen in the following pages, and it is earnestly to be hoped that a knowledge of the true interests of the country will lead to effectual measures for this end, before vested rights have been established to embarrass us before the need of these measures has become urgent.

Former Timber Regulations in Canada.

The system of granting licenses to cut timber on the public lands in Canada was introduced in 1827, and since that time the right of renewal upon compliance with regulations has been practically acknowledged. In 1845 an Order in Council was passed limiting the licenses annual cut with the above understanding, and in the year of 1849 the power was permitted to transfer his limit by simple assignment. In 1851 a ground-rent system was introduced.

The system of [illegible] rents on timber portions of Crown lands was [illegible] under the former government of Canada in 1842. A system of local agencies was established and returns have been kept [illegible] at the time when the Dominion government was established. Among the powers of revenue was the [illegible] of [illegible] without [illegible] the [illegible] of public advertisement. A [illegible] was established [illegible] which [illegible] reserved for [illegible] to [illegible] more [illegible] on the rate [illegible] as the [illegible] using.

As means of [illegible] of timber [illegible] always [illegible] it may be interesting to [illegible] the [illegible] as [illegible] to [illegible] the [illegible] the [illegible] to the test of trial.

* Hough: Report upon Forestry. (U. S.) 1878-79.

The Superintendent of Crown Lands of Canada in his report for the year 1846 in [illegible] the working of this new system. It was to remain seen however that the operation of such a system would reach a crisis within a limited period. That although it would scarcely be said to be even a check in any degree upon emigration in the first instance the increase in the annual rents on unoccupied tracts after the first few years became so sudden and great that a crisis became inevitable.

This crisis arrived in the year before last (1845) the rents of unoccupied lots having in many cases reached a figure the preceding year which if again doubled with a certainty of being quadrupled in 1850 would have rendered the ground untenable.

A general effort was therefore made by those interested to have the system suspended or restricted. A new feature in the controversy arose on this occasion from the interference of a great body of the [illegible] merchants of Quebec who entertained a peculiar interest in the views of those of the practising barristers who [illegible] to be removed from the accumulating ground rents.

The timber trade being one of the principal resources of the country the circumstances by which it is governed must always be of great moment and worthy of the greatest consideration and therefore I trust that the importance of the subject to the country at large may be deemed sufficient to warrant a pretty extended reference to the circumstances features upon and at the period of the crisis referred to and which has resulted in establishing a degree of permanency in the not unfounded commercial which which was previously unknown.

As the timber trade is ordinarily conducted in this country there are two distinct branches of it viz that in which the producer is engaged and that which is carried on by the shipper. There are some firms who are engaged in both branches of the trade but although such are numerous they are always distinct from and sometimes antagonistic to each other. The principle feature in which they conflict is that it is the interest of the producer that the prices of timber should be compared with the cost of production while it is the interest of the shipper that there should be a low rate in the timber markets of the country as compared with the prices in England.

This subject was very fully treated of in the evidence taken before the parliamentary committee in 1840 & pointed to inquire into the causes of the ruinous state of the trade which had existed for some years previous to that late [illegible] of [illegible] which I may not be considered unfortunate in so far as the greatest evils the trade has ever had to contend with since it grew to anything like its present importance.

By the evidence obtained by the committee on that occasion it will be seen that commencing with the year 1836 there was a supply in the timber market which disproportionate to the demand [illegible] caused by an extensive [illegible] and speculation and aggravated in the succeeding years by a [illegible] arising from the general depression of commercial affairs which occurred in 1837. The important fact to be observed here is that in 1840 a year in which the statistics of the trade proved that all the elements of prosperity existed in the highest degree the most wide spread ruin occurred among the producers. The business of 1841 was not profitable to the country and to none more engaged in the trade whose the business of 1840 was ruinous to individuals and a loss to the country. The demand and the shipments in 1841 exceeded those of previous years the demand and the shipments in 1840 were equal a great if even a greater in excess of those of the previous year. The reason of the prosperous state of the trade in the one year and its ruinous state in the other is therefore to be found in the fact that in 1841 the supply was in just proportion to the demand

half its value

preponderance of their particular views

sustained by facts.

as the most efficient [illegible]

for the purposes of trade the government cannot control

was ultimately broken up

"The memorialists also stated that the monopoly of which they complained was to the almost total exclusion of those whose means or influence was not so great as to obtain limits.'

There was here a remarkable instance of men of high position in lowering to meet the with other people's affairs and being the only ones to commit the one vice to vulgar errors on matters of which they were themselves wholly ignorant.

"It will be seen that in the memorial they asserted two distinct grievances as the cause of the monopoly they complained of. First that those without a certain amount of means could not obtain limits or timber berths and second that limits of large means could be obtained by influence. The first must indeed be admitted. Men of means will secure timber berths as well as horses and lands and scrips to the exclusion of those whose means are not so great as to obtain them. It is an old grievance for which governments have not yet found a remedy.

And even if at the suggestion of these memorialists who, by the way, were not of the class who usually advocate such a doctrine the government had taken, or should yet take, some unlimited way of throwing timber berths into the hands of those who have not means to obtain them in a legitimate manner those who possess means would oppose the tenure, protest the investments immediately buy them out and then there would be the same cry for a repetition of the operation.

"With respect to the second grievance it is sufficient to say that it is not to be found in the law or the regulations affecting the trade, and as it can only exist in violation of both the memorialists should have established the fact before they claimed credit for it as such whereas they did not attempt to substantiate even one case of such violation.

They suggested a commission to find if the license holders were making or intending to pay etc. their timber berths should be thrown open to competition, as they the memorialists believed that notwithstanding the depressed state of the trade at that time they would readily be taken up by others without loss to the revenue.

It is difficult to write seriously upon such a proposition. There can be no doubt that of the opportunity had several and had been taken advantage of to submit to public competition privileges which have already been in many cases clearly bought and in the development of which on the whole hundreds of thousands of pounds of private means have been expended (as will by returns laid before Parliament in 1862) they would readily be taken without loss to the revenue but it was an issue not more reasonable nor likely than that the statements of the memorialists would have been made available to the revenue if they had asked for a change in the navigation laws.

"Such was the false position assumed by the shipping interest at the period referred to but the erroneous grounds upon which they caused the prayer of the petitioning merchants of course made no argument either for or against the latter, which had to be dealt with upon its own merits.

"The memorial of the petitioning merchants was signed by some of the shipping merchants also who are connected with or interested in the business of the producers and there appeared to be two or three firms not known to the department to be connected with the producing interest who signed it is presumed in a liberal view of what they conceived to be for the good of the country and the trade at large. Some merchants and others at Ottawa had also joined in it who are not personally engaged in the trade but whose interests are bound up with those of the producers.

The object of the memorial as expressed was to obtain a remission for three years or until the then existing depression had passed away of the penalty imposed for non-occupation of timber berths. Although the request was professedly of a temporary nature however it would no doubt have been made a precedent for several years' government interference in every fluctuation of the trade thereafter. It would have been the first precedent that could be quoted since the adoption of the new system and therefore I shall state the reasons that induced its rejection as I consider that upon the integrity of the system being maintained in the future depends much of the prosperity of the trade.

It is to be observed that when the great depression occurred in the trade which began in 1866 and from which it was about four years before it could be said to have recovered the ground rent system was not in force. Timber berths were at that time subject only to the payment of the amount of duty covered in the purchase deed. They were then as now charged to every year but on the payment of the right to renewal of license instead of the penalty of an increased payment.

It was contended of this system that it favored those persons who as a berth could only be passed upon at a very heavy expense and then it was supposed to be repurchased by the former holder. The standard of occupation that is the quantity required to be cut to constitute occupation, was in 1865-66 made too high thereby having a tendency to favor production. In order more to the entry of monopoly a discretionary power was also given to the department, about the same time, there being then no statute upon the subject that on the larger timber berths would be entitled to three years' grace, although never acted on, afforded had a tendency to favor production as licensees holders were naturally desirous of making the most of their berths by cutting all the best timber in the interim.

Parties differed greatly as to the exact amount of influence these rules exercised upon the overproduction but it was generally admitted that they exercised some influence in that way. At all events the result of the miserable state of the trade was that the government of the day acted upon these parties and the notice of cut licenses was withdrawn the standard of occupation was reduced and finally the parties were allowed from year to year up to 1880 to hold their timber berths without any condition of occupation at all and without any payment where they did not choose to occupy.

The action of the government on the trade during the period of great prosperity and succeeding depression referred to was thus in opposite extremes. It therefore became evident that a better permanent system of regulations should be framed for the government of the trade and the regulations of which the ground-rent system is a part were finally the result.

By this system an annual ground rent was imposed on timber berths in excess of the duty as a regular permanent charge and as a check upon mere pass it was provided by way of penalty that the ground rent should be doubled upon such renewals of license on berths which had not been occupied during the preceding season and even more doubling every year so long as the berths continued unoccupied. Thus the rent paid for the largest size of berth the regulations permit—in excess of all other charges—is £6 the same being payable annually.

But upon non-occupation for one season the rent rises to £12 10s. upon non-occupation for a second season to £25 for a third season to £50 and so on (as the system was first introduced) without limit but reverting to the original rate of £6 5s. whenever occupation recommenced.

During the first few years after the introduction of this system it could not

force production to any [illegible] sensible extent, but the constant increase, in [illegible] increased [illegible] of [illegible] was to enforce it

'It was not, therefore, as put by the opponents of the producing interest, a [illegible] non-occupation had been made too severe or not.

[illegible] temporary suspension of the penalty

advantage of their outlay

ically extremely difficult of application

be numerous, the [illegible] constant accusations of partiality and favor

manency to the system as a whole instead of impairing it.

[illegible] It must be remarked as a general rule that any departure [illegible] calculated in every case to produce a bad effect

[illegible] just.fy its being made an exceptional case.

[illegible] ters consequent thereon

[illegible] stability to the trade and satisfaction to the publ[illegible]

[illegible] the year before, to adopt for the safety of the trade.

[illegible] carry it to market

[illegible] and fluctuation.

[illegible]

ally serious apprehension entertained by many that a time of great embarrassment and difficulty was at hand while a crisis had actually arrived in regard to testing the efficacy of the by laws by which the trade is governed so far as it is as a whole affected by the operations on public lands and because therefore the action then taken has so far solved a difficult problem and is likely to exercise a permanent influence on the trade."

As practised by experience the management of the timber interests upon the public lands in the later years of the former Canadian Government was in charge of the Commissioner of Crown Lands who was authorized to grant licenses for cutting timber upon ungranted lands at such rates and subject to such regulations as might be established from time to time by the Governor-in-Council and of which notice was given in the Canada Gazette. These licenses were granted for a period not exceeding twelve months and obliged the licensee to make returns at the expiration of the lease showing the number and kinds of trees cut and the quantity and description of saw logs or of the number and description of sticks of square timber manufactured and carried away under such license which statement must be verified by affidavit before a justice of the peace. The Crown dues were a claim upon the timber or any part thereof, wherever found and whether in the original logs or made into deals boards or other stuff and which might be seized and detained wherever found until the dues were paid.

Persons cutting or causing to be cut any timber on any of the Crown, clergy reserves or other public lands or removing or inducing or assisting in the removal of timber thus cut without authority acquired no right or claim for cutting or preparing for the market but the whole became forfeited and if the timber or saw logs had been removed out of the reach of the officers of the Crown lands department or if it was found elsewhere impossible to seize the same the person was liable in addition to the forfeiture of his labor and instruments to a forfeiture of $3 for every tree cutting and carriage that might be proved to have been cut to be recovered with costs of suit in the name of the Commissioner of Crown Lands or resident agent in any court having jurisdiction in civil matters to the amount of the penalty. In all such cases it was incumbent on the party charged to prove his authority to cut and the averment of the party seizing or prosecuting that he was duly empowered under the timber act was to be received as sufficient proof thereof unless the defendant proved to the contrary.

Seizures might be made upon information supported by affidavit. If the timber illegally cut had been mixed with other timber the whole might be detained until satisfaction was granted by the owner. Resistance to an officer or authorized agent by assault force or violence or by threats of such was made a felony and the carrying away of timber under seizure whether openly or secretly and whether with or without force or violence was declared felony and rendered the person liable to punishment for felony. Whenever any timber was seized for the non-payment of Crown dues the burden of proof of payment or as to the land on which it was cut was to rest on the claimant of such timber and not upon the officer making the seizure or the party to whom the proceeds

Timber seized was to be deemed to be condemned at the end of thirty days and proclamation of notice given by the person seizing posted at the nearest office or agent of the Crown and unless that he intended to prove his claim

Any owner of [illegible] timber might give the person of whom seized upon receiving from the agent either a bond with two good and sufficient sureties first approved by the agent for double the value of the timber or cause an estimate and appraisement being taken in the name of the

Commissioner of Crown Lands, and to be delivered and kept by him until the claim was released or paid. Every person availing himself of any false statement or oath to evade the payment of Crown dues forfeited the timber on which dues were attempted to be evaded.

The malicious cutting or loosening of a boom, or the cutting loose or breaking up of a raft or crib was made punishable by fine and imprisonment of not less than six months.

Such in brief was the system formerly in force. That it did not insure the forests upon the Crown lands from pillage and waste by lumbermen is sufficiently proved by the following statement made by the Commissioner of Crown Lands of the Province of Ontario, in 1877 in describing the system of supervision then in use and the abuses that had been formerly practiced:

"Previous to confederation, the guardianship of the forests as regards surveillance over the cutting of timber under license or in trespass on lands of the Crown was so ineffective or attended to with such laxity as to be in fact no guardianship at all, and pillage to a large extent was carried on almost with impunity. The seat of government was peripatetic * and the agents of the Crown Lands Department for the collection of timber dues were located at certain points where returns were brought to them of such operations as parties chose to make, on which dues were paid, and the amount received with statement of timber, etc. on which it was paid, transmitted monthly to the department without any actual knowledge of or check on the extent of cutting, these returns and moneys were received at head quarters without comment or inquiry, and the one debited to the agent and the other placed to his credit."

AMOUNTS ACCRUED AND COLLECTED FOR TIMBER DUES, GROUND RENTS, AND BONUSES IN UPPER AND LOWER CANADA, DURING THE YEARS PRECEDING THE FORMATION OF THE DOMINION GOVERNMENT.

Years.	Accruals			Collections.		
	Upper Canada.	Lower Canada.	Total.	Upper Canada.	Lower Canada.	Total.
	$ c.	$ c.	$ c.	$ c.	$ c.	$ c.
1857	135,310 64	120,797 96	256, 08 60	94,921 15	114.023 53	208,944 68
1858	111,739 62	111,081 53	222,821 15	141.185 90	134,476 00	275,661 90
1859	140,409 96	142,071 97	282,481 93	136,189 33	145,745 59	281,934 92
1860	176,400 39	168,973 36	345,433 75	149,921 22	168,330 38	318,252 60
1861	196,253 57	154,101 38	310,354 95	127.995 58	127,849 10	255,844 98
1862	143,357 59	136,830 72	280.188 33	159.330 86	144,321 31	303,672 17
1863	170,160 2	157 484 72	327 644 84	197 098 73	189,562 80	386,656 53
1864	188,171 74	155,793 97	343,965 71	121,967 79	121 718 52	243,096 71
1865	146,079 67	151 034 24	297,113 91	183,380 75	160,035 23	343,415 98
1866	203,040 46	166,098 54	369,077 00	197 960 85	138,678 05	336,643 89
Total 10 years.	1,570,983 76	1,464,206 46	3,035,190 22	1,569,952 46	1,444,740 50	2,954,092 96

* For some years before the union of 1867 the seat of government of Canada alternated between Toronto and Quebec. It had previously been located at Montreal, and at a still earlier period at Kingston.

RECEIPTS FROM BONUSES AND GROUND RENTS ALONE, DURING THE UNION OF THE PROVINCES OF CANADA SO FAR AS THESE HAVE BEEN PUBLISHED

Fiscal years.	Amount
1856-57	$244,112 90
1857-58	203,263 59
1858-59	276,741 16
1859-60	316,983 35
1860-61	290,933 04
1861-62	[illegible] 31
1862-63	301,232 15
1863-64	325,294 51
1864-65	324,535 61
1865-66	300,486 18
1866-67	369,800 53

RECENT AND EXISTING TIMBER REGULATIONS IN CANADA

(a) *Dominion Lands* These lands, in Manitoba and the North west Territories are in charge of the Department of the State and a division thereof styled "The Dominion Land Office." The act under which they are administered was assented to April 14th, 1872 The surveys are conducted by the Surveyor-general and his deputies, and there are various agents concerned in the duties incident to this interest.

The system of surveys is by townships six miles square, sub-divided into sections of one mile square each unless this arrangement is modified by the divergence of meridians, irregularities in previous surveys, or other causes. There is an allowance of one chain and fifty links between all townships and sections for roads. The townships are numbered northward from the international boundary or the forty ninth degree north latitude and in Manitoba, east and west from a principal meridian, ran in 1869 that strikes this line of latitude about ten miles west of Pembina. The sections are numbered from one to thirty six in each township, beginning at the south east corner and running alternately from east to west and from west to east so that the last number shall be in the north east corner In this the order of numbering is just the reverse of that employed on the surveys of public lands in the United States Sections eleven and twenty nine in each township are reserved for education.

The sections are divided into sixteen squares of forty acres each numbered in the same way as the sections in townships, beginning at the south east corner The lines running north and south are designed to be true meridians, and those running east and west are chords intersecting circles of latitude passing through the angles of the townships.

The terms and conditions of the deed of surrender from the Hudson Bay Company stipulated a reservation of one twentieth part of the portion described as the "fertile belt," which rendered it necessary to modify the general plan, and in the prairie region, where there are islands or belts of timber a special mode of sub-division was provided, with the view of affording benefit to the greatest possible number of settlers, and for the prevention of petty monopolies. In these cases the woodlands are surveyed into lots of not less than ten nor more than twenty acres each, so as to afford one wood lot to every quarter-section of prairie farm in each township This, however is not allowed to interfere with the sections set apart for schools, nor to those set apart and vested in the Hudson Bay Company Each wood lot is required to front on a section road allowance.

In case an island or belt of timber come entirely within a quarter section, or several quarter-sections so that not more than twenty five acres shall be included in each it is not to be separately surveyed into wood lots. These wood lots are conveyed as homestead grants the same as other lands but the grantee is not allowed to sell any of the timber on his lot to any saw mill owners or to any other than settlers for their own private use under penalty of prosecution as for trespass. Upon conviction they may be fined or imprisoned or both and they further forfeit their claims absolutely.

Any tract of land covered by forest timber may be set apart as timber lands and reserved from sale and settlement and except as it may be thought expedient by the secretary of State to divide a township into two or more timber limits, the several townships comprising any such tracts shall each form a limit. The word "timber" is used to designate all timber and all products of timber including firewood and bark.

Leases for cutting timber may be granted for twenty one years and upon the following conditions:—

1 The power to erect a saw mill or mills in connection with such limit and lease and subject to any special conditions which may be agreed upon and stated in the lease such mill or mills to be of capacity to cut at the rate of a thousand feet board measure in twenty four hours for every two and a half square miles of limits in the lease or shall establish such other manufactory of wood goods as may be agreed upon as the equivalent of such mill or mills and the lessee to work the limit in the manner and to the extent provided in the lease within two years from the date thereof and during each succeeding year of the term.

2 To take from every tree he cuts down all the timber fit for use and manufacture the same into sawn lumber or some other such saleable product as may be provided in the lease or by any regulations made under this act.

3 To prevent all unnecessary destruction of growing timber on the part of his men and to exercise strict and constant supervision to prevent the origin or spread of fires.

4 To make returns to the government monthly or at such other periods as may be required by the secretary of State or by regulations under this act, sworn to by himself by his agent or employee cognizant of the facts declaring the quantities and description of all wood sawn lumber timber ties railway car stuff ship timbers and knees shingles lath cord wood or bark or any other product of timber from the limit in whatever form the same may be and otherwise disposed of by him during such month or other period and the price or value thereof.

5 To pay in addition to the bonus an annual ground rent of $2 per square mile, and further a royalty of five per cent. on his monthly account.

6 To keep correct books of such kind and in such form as may be provided by his lease or by the regulations under this Act and to open the same for the inspection of the inspector of limits whenever required for the purpose of verifying his returns aforesaid.

7 [illegible] clear to the lands upon which the timber may be cut and that vest in the lessee during its continuance the right to take and keep exclusive possession of the lands so granted except [illegible] from time to time for the purposes or reserved to and from such lease shall vest in the timber thereon all right of property whatsoever in all trees timber lumber and other products of timber cut within the limits of the lease during the continuance thereof whether such trees timber and lumber or products be cut by authority of the holder of such lease or by any other person with or without his consent and such person shall entitle the lessee to seize on removal examination or otherwise as his

if the lease had not expired

claims and costs

cases to the amount claimed

paid when due

thereof, unless the defendant proved to the contrary

until a decision could be had by competent authority

13 F)

If timber cut without authority has been made up with other timber into a crib, drawn or raft or in any other manner mixed up with other timber so that it cannot be accounted the whole of the timber so mixed is to be liable to seizure and forfeiture until satisfactorily separated by the owner. Timber held under seizure may be released upon settlement secured for the payment of its full value or for double the amount of all dues, fines, penalties and costs incurred or imposed thereon.

The penalties for resisting seizure or removing timber after it was seized were prescribed and proceedings thereon settled. Nothing in any grant of Dominion lands was to give any title to any slide, dam, pier or boom previously erected upon it unless expressly mentioned in letters patent or other instrument establishing such grant. The free use of such works was not to be interrupted and the right of passage and repassage on foot or otherwise, whenever necessary, was and at portages, was reserved.

The Dominion Lands Act makes provision for military bounties, homestead entries, leases for grazing, and hay cutting, mining, etc., and for direct sales of land.

(2) Ontario Timber Act. The Timber Act now in force was passed in 1849 and is found as Chapter 28 of the Revised Statutes of Ontario, 1887. It is as follows:—

(1) An Act Respecting Timber in Public Lands

Her Majesty, by and with the advice and consent of the Legislative Assembly of the Province of Ontario, enacts as follows:—

1.—(1) The Commissioner of Crown lands or any officer or agent under him authorized to that effect may grant licenses to cut timber on the vacant lands of the Crown at such rates, and subject to such conditions and restrictions as may from time to time be established by the Lieutenant-Governor-in-Council, and of which notice may be given in the *Ontario Gazette*.

(2) No license shall be so granted for a longer period than twelve months from the date thereof, and if, in consequence of incorrectness of survey, or other error or cause whatsoever, a license is found to comprise any lands not included in a license of a prior date, the license last granted shall be void in so far as it interferes with the one previously issued, and the owner or proprietor of the license so rendered void shall have no claim upon the Government for indemnity or compensation by reason of such avoidance.

2. The licenses shall describe the lands upon which the timber may be cut, and shall confer for the time being on the licensee the right to take and keep exclusive possession of the lands so described, subject to such regulations and restrictions as may be established. And the licenses shall vest in the holders thereof all rights of property whatsoever in all trees, timber and lumber cut within the limits of the license during the continuance thereof, whether such trees, timber, and lumber are cut by authority of the holder of the license or by any other person with or without his consent; and the holders shall be entitled to seize in revendication or otherwise such trees, timber or lumber, wherever the same are found in the possession of any unauthorized person, and also to institute any action against any wrongful possessor or trespasser, and to prosecute all trespassers, and the offenders to punishment, and to recover damages, if any; and all proceedings pending at the expiration of any license may be continued to final determination as if the license had not expired.

3 Every government road allowance included in any Crown timber license, heretofore granted or which may hereafter be granted under section 1 of this Act shall be deemed and taken to be and to have been granted lands of the Crown within the meaning of said section and shall be as such to be included in the license.

4 The licensee or nominee named in any license shall be deemed and taken to have and to have had all the rights in respect of every such road allowance and the trees timber and timber thereon or cut thereon as were or by the section 2 of this Act may be conferred upon him in respect of any other Crown lands embraced in such license and the trees timber and timber thereon or cut thereon except that he shall not be entitled to take or keep exclusive possession of such road allowance.

5 No by-law passed or to be passed by any municipal council for preserving or otherwise appropriating or disposing of the timber or trees or any part thereof on a government road allowance or allowances included in any such license shall be deemed or taken to have had or have any force or effect against any such license.

6 In case the council of any township be organized as a separate municipality or the council of any united townships have passed or hereafter pass any by-law for preserving or saving the timber or trees on the government road allowances within such township or within the senior township of any united township and no deduction on account of such by-law be made from any such license the corporation of such township or united townships shall be entitled to be paid out of the consolidated revenue fund of this Province a sum equal to two per centum of the dues received by Her Majesty for or in respect of the timber and saw logs which during the existence of the by-law were cut within the township or united townships under the authority of the license but no corporation shall be entitled to such percentage of the dues received for timber or saw logs cut during the times or seasons when timber or trees on any such road allowances were not or could not be cut or removed for wood cutting or removal the corporation had before the fifteenth day of February one thousand eight hundred and seventy-one obtained a verdict against any such licensee or nominee.

7 No municipal corporation shall be entitled to such payment as aforesaid, unless a certified copy of the by-law passed or to be passed as aforesaid accompanied by an affidavit of the clerk or reeve of the corporation verifying the copy and the date of the passing of the by-law is lodged in the Department of Crown Lands at Toronto within six months from the passing of the by-law, and the affidavit may be made or taken before any person or officer who under sections 42 or 43 of *The Public Lands Act* is authorized to take the affidavits in those sections mentioned.

8 All moneys to be paid as aforesaid to any municipal corporation shall be expended for the improvement of the highways situate within the township or within the senior or junior township in respect of which such moneys were paid.

9 The percentage to which the junior township or township of such united township may be entitled shall only be in respect of the dues received upon timber or trees which shall be cut after the 30th day of April 1881. (See Rev. Stat. Ont. c. 24, ss. 13 to as to the right of the Crown to grant timber licenses on Free Grant Lands.)

10 [illegible] the [illegible] to the [illegible] Crown Lands a return [illegible] grants [illegible] and description of [illegible] and [illegible] and declare [illegible] sworn [illegible] before [illegible] Justice of the Peace [illegible] or attempting [illegible] shall be [illegible] and [illegible] dealt with accordingly.

11 (1) All [illegible] Crown [illegible] found [illegible] and [illegible] Such [illegible] Nothing [illegible] the [illegible] Statutes of Canada as regards [illegible]

12 [illegible]

13 [illegible]

14 (1) [illegible]

(4) [illegible]

15 Where satisfactory information supported by affidavit made before a justice of the peace or before any other competent party is received by the Commissioner of Crown Lands or other officer or agent of the Crown Lands Department that any timber or quantity of timber has been cut without authority on Crown survey, school or other public lands and describing where the timber can be found, the Commissioner, officer or agent or any one of them may seize or cause to be seized in Her Majesty's name the timber so reported to be cut without authority wherever it is found and place the same under proper custody until a decision can be had in the matter from competent authority.

16 Where the timber so reported to have been cut without authority on the public lands has been run with other timber into a creek, drain or raft or in any other manner has been so mixed up at the mills or elsewhere as to render it impossible or very difficult to distinguish the timber so cut on public lands without license from other timber with which it is mixed up, the whole of the timber so mixed shall be held to have been cut without authority on public lands and shall be liable to seizure and forfeiture accordingly until satisfactorily separated by the holder.

17 Any officer or person seizing timber in the discharge of his duty under this Act may on the name of the Crown call in any assistance necessary for securing and protecting the timber so seized.

18 Whenever any timber is seized for non payment of Crown dues or for any other cause of forfeiture or any prosecution is brought for any penalty or forfeiture under this Act, and a question arises whether the said dues have been paid on such timber or whether the timber was cut on other than the public lands aforesaid, the burden of proving payment or on what land the timber was cut, shall lie on the owner or claimant of the timber and not on the officer who seizes the same or the party bringing the prosecution.

19 All timber so seized under this Act shall be deemed to be condemned unless the person from whom it was seized or the owner thereof within one month from the day of the seizure gives notice to the seizing officer or nearest officer or agent of the Crown lands office that he claims or intends to claim the same, failing notice the officer or agent seizing shall report the circumstances to the Commissioner of Crown Lands, who may order the sale of the said timber by the officer or agent after a notice on the spot of at least thirty days.

20. (1) Every judge having competent jurisdiction may, when he deems it proper try and determine such seizures and may order the delivery of the timber to the claimed owner on receiving security by bond with two good and sufficient sureties to be first approved by the agent to pay double the value in case of condemnation.

(2) The bond shall be taken in the name of the Commissioner of Crown Lands to Her Majesty's use, and shall be delivered up to and kept by the Commissioner.

(3) If the seized timber is condemned the value thereof shall be forthwith paid to the Commissioner of Crown Lands or the agent and the bond cancelled, otherwise the penalty of such bond shall be enforced and recovered.

21 Every person availing himself of any false statement or oath to evade the payment of Crown dues shall forfeit the timber on which dues are attempted to be evaded.

(2)—Management of the Timber Lands of Ontario.

Previous to June 17th [illegible] provisions for [illegible] timber on the Crown lands were made by the several Crown officers who might grant such privileges upon payment at the rate of 2s 6d [illegible] per square mile annually payable in advance. These were expired on the 30th of April each year and might be renewed before the 1st of July following. The [illegible] timber licensed are learned by the Commissioner of Crown Lands in a statement prepared for the information of the Executive Council of Ontario in 1867, a short excerpt of which has been furnished us as follows: On the 14th of June 1849 [illegible] regulations were approved and the whole remaining unsurveyed timber was divided into [illegible] districts, in each application was provided that such timber as the Commissioner of Crown Lands saw fit should be offered at public auction, to be held half-yearly in such [illegible] agencies on the 10th of July and 10th of January of each other [illegible] dates as the Commissioner might think proper to put the [illegible] timber at an upset price of $4 per square mile or such rate as to him might seem proper before the same to be award to the highest bidder, and an annual [illegible] the yearly ground rent of fifty cents per mile and half [illegible] on timber when cut the Commissioner or agent in the interval between sales to grant licenses on a [illegible] on payment of the bonus and ground rent mentioned.

The Regulations of 1851 and those of 1853 opened a way for [illegible] occupation of timber lands as follows: If a [illegible] unsurveyed territory had not been occupied or worked upon during the season for which license was granted or renewed or in unsurveyed territories the year after granting or renewal of license the ground rent of fifty cents was forfeited and in case of non-occupation until the ground rent reached [illegible] $4 $5 or maximum charge per square mile at which rate it stood till the berths had been worked upon which the rent for again to fifty cents per mile the making of an average of 500 feet of square timber or twenty saw logs to the mile being admitted as the occupation. The object of [illegible] occupation or the payment of an increased ground rent was to prevent large areas of the country from falling into the hands of capitalists to the exclusion [illegible] of men [illegible] means but the practice of allowing large [illegible] rent was easily evaded seeing that the holders of large [illegible] tract or tracts to have cut 7 cubic feet of square timber or 1000 logs it [illegible] have been maintained at fifty cents per mile rent or reduced [illegible] the rent been advanced.

After [illegible] competitive [illegible] which was [illegible] and the ground rent increased from fifty cents to $2 per square [illegible] by the third clause of existing regulations it is made [illegible] that all [illegible] berth shall be sold by public auction to the highest bidder at the upset price of twenty per square mile that berths should be offered for sale at such times and places as the Commissioner thought fit instead of at any particular rate or time as it that in the interim between [illegible] new [illegible] be granted as under the regulations of 1866.

[illegible] of the Commissioner of Crown Lands with respect to [illegible] of timber berths would seem clear and simple enough, he is to [illegible] system proceed from the necessity of [illegible] against the [illegible] operations but the fact is that the management of [illegible] lands is surrounded by many difficulties and the cost of working the settlement of the country which is extensive and rapidly taking place in territories [illegible] under timber [illegible] where lumbering operations are being carried on [illegible] with the location of the lands.

from that date.

(3) Crown Timber Regulations

April, 1869).

1st. The Commissioner of Crown Lands may at his discretion cause the [illegible] surveyed and run, the costs of such survey to be paid by the [illegible] license, and where two or more licenses are interested in the [illegible] Commissioner shall determine what portion of the costs of the survey [illegible] berth, to be paid with the ground rent before renewal of the license

2nd. [illegible] divided into as many timber berths as he may think proper

3rd. [illegible] the highest bidder for cash at the time of sale

4th. [illegible] of Crown Lands may direct

5th. [illegible] the locality, and open to public inspection

6th. [illegible] the time of such approval, to be expressed in writing.

8th. Timber berths are to be described in new licenses as "not to interfere with [illegible]

the award of such arbitrators or of such umpire shall be made and delivered to the parties and such award shall be binding on them.

11. Timber cut on limits for which a license has been suspended or held in abeyance shall be considered as having been cut without authority and treated accordingly.

10. Occupants, locatees or purchasers of public lands who have not completed all the conditions of sale or location shall not, unless under settlers license or for clearance of fencing or erecting buildings on the said land be permitted to cut timber or grass thereon or to dispose of it to others. Persons found doing so shall be subject to the penalties established by law for cutting timber on the public lands without authority.

11th. All timber berths are to expire on the 30th of April next after the date thereof and all renewals are to be applied for and issued before the 1st of July following the expiration of the last preceding license or default whereof the right to renewal shall cease and the berth or limit shall be considered as forfeited.

12th. No renewal of any berth shall be granted unless or until the ground-rent and all costs of surveys and all dues to the Crown on timber, saw logs or other timber cut thereon and by virtue of any license other than the last preceding, shall have been first paid.

13th. All timber berths or limits shall be subject to an annual ground rent of $1 per square mile payable in advance before the issuing of any original license or renewal.

14th. All timber, saw logs, wood or other timber cut under any license now in force or under any license which may hereafter be granted shall be subject to the payment of the following Crown dues, that is to say:—

Black walnut and oak, per cubic foot	$0 03
Elm, ash, tamarac and maple, per cubic foot	0 02
Birch, basswood, cedar, buttonwood and cottonwood, and all boom timber, per cubic foot	0 01½
Red and white pine timber (per O.C. 27th April, 1887), per cubic foot	0 02
All other woods	0 01
Basswood, buttonwood and cottonwood, saw-logs, per standard of 200 feet board measure	0 15
Red and white pine saw logs and boom timber, per standard of 200 feet B. M., (per O.C. 27th April, 1887)	0 20
Walnut, oak and maple saw-logs, per standard of 200 feet board measure	0 25
Hemlock, spruce and other woods, per standard of 200 feet board measure	0 10
All unmeasured squared saw logs, to be taken at the average of the lot, and to be charged for at the same rate	
Staves, pipe, per mille	7 00
Staves, West Indies, per mille	2 25
Cordwood (hard) per cord	0 20
Cordwood (soft), per cord	0 12½
Hemlock tan bark, per cord	0 30
Railway timber, knees, etc., to be charged 15 per cent. *ad valorem*.	

15th. The duties on timber shall be charged upon the quantity shown by the specification of measurement at the office of the supervisor of cullers at Quebec or that of the deputy supervisor of cullers at Sorel or Montreal, or by other reliable measurement, but where such actual measurement cannot be obtained each stick of white pine timber shall be estimated as containing seventy

such count

forfeiture of his right to a renewal of his license

license, together with the dues thereon

in such raft ... being satisfied of the correctness of such report ... shall the ... Crown Timber Agent may grant a clearance ... for such raft stating ... number of pieces and description of timber contained therein, ... distinguishing the timber cut on private lands and under settlers' license from that cut on the Crown domain.

20. The owner or holder of any such raft or parcel of timber shall within twenty-four hours after the same shall arrive at its destination at the ... Mouth of Western ... report such arrival to the Crown Timber Agent, and shall ... such raft to the ... Agent or Officer of the Department ... and shall thereupon ... the number of pieces ... contained therein ... and ... as having been cut and drawn without ... subject to the payment of dues accordingly.

21. Parties omitting to obtain their clearance at such agency, or omitting to report the arrival of such raft at its destination as above ... may be ... for the ... and ... of the ... of the ... Statutes of Canada.

22. Persons evading or refusing the payment of timber dues or the final settlement of bonds or promissory notes for the payment of such dues, or in connection with the Crown timber ... or ... as persons taking ... licenses ... of unpatented ground ... obtaining ... fraudulent manner, and persons refusing ... with the ... or ... of the ... as provided by the ... of these regulations or with the regulations established by ... or who ... interrupt ... in the discharge of their duty, ... forfeit further ... and their ... shall be forfeited at the expiration of the then existing license.

23. All ... timber cut under license remaining unpaid on the ... November following the season in which it was cut ... subject to ... from that date, but without ... to the power of the Crown to enforce payment of such outstanding dues at any time the Commissioner of Crown Lands may think proper.

(4) On the Various Forms of Timber Licenses in Use

There are four forms of timber license in use in the Province of Ontario, two for what is called the "Western Timber District," and the "Bel ... Districts ... for timber ... and ... for ... Crown. Two forms of licenses are used for the "Ottawa Agency," one having a stipulation concerning road allowances, and the other not, but both conferring the right to cut rafting stuff from the Crown lands.

The reason why the right to cut rafting stuff is confined to the Ottawa Agency ... the Ottawa ... and ... from ... up the river ... from ... tributary streams ... have to be ... and re-rafted ... in ... cases ... before the timber ... destination, whereas in the rivers ... other parts of the ... rafting takes place for timber and logs ... driven down the streams ... to ... reach the large waters of the lakes ... the River St. Lawrence ... on the shores of which rafting stuff can be cut or purchased.

The following copy of the stumpage form of license used in the Western Timber District will, with its notes, give an idea of these different licenses.

(C) Form of a Timber License in the Western Timber District

By authority of Chapter 26 of the Revised Statutes of Ontario, and the [illegible] made and to be made to Her Majesty [illegible] and unto [illegible] nts or workmen, full power and license to cut [illegible] Act, by Chapter four of the Statutes of Ontario of 1880, and pine and cedar trees which reserved on lots sold under Order in Council of 3rd April, 1880, prior to the date of this license, and pine trees on lots patented under said Chapter [illegible] the Lock hereof by [illegible] and to hold and occupy the said location to the exclusion of all others, except as hereinafter mentioned from [illegible] to thirtieth of April, 18[illegible], and no longer, with the right of conveying away the said timber [illegible] through any ungranted unoccupied or waste lands of the Crown.

And by virtue of this license, the said Licensee [illegible] right by the said [illegible] the ground hereby assigned, with full power to seize and recover the same.

But this license is subject to the following conditions, viz.:—

To the withdrawal therefrom of lots located or sold under the Free Grants [illegible] Act of 1868 [illegible] Statutes [illegible] tlement had been complied with prior to thirtieth [illegible] date or issue of the license.

That any person or persons may at all times make and use roads upon and [illegible] over the ground hereby licensed.

That nothing herein shall prevent any person or persons from taking from [illegible] pensation therefor) to be used for the making of roads or bridges or public works, by or on behalf of the Province of Ontario, the authority of the Department of Crown Lands having first been obtained.

That persons setting under lawful authority or title within the location [illegible] by the said License or any one acting for [illegible] or by permission.

That the Commissioner of Crown Lands, under Order in Council of 27th [illegible] *bona fide* intention of location or purchase.

And further under condition that the said License or [illegible] represents [illegible] this License to be counted or measured, and settle for the duties chargeable [illegible]

other penalties as the Act provides

Given under my hand at Toronto, the day of in the

Commissioner

follows —

bonding

This license not to interfere with prior licenses

66 System of Wood Rangers Efforts to Prevent Waste

describes the operation of these regulations and the system of wood ranging was then inaugurated. This is admitted at first to be an experimental, but it has since gone on with modifications as suggested by experience, until it is deemed at present as perfect as can practically be carried out.

employed each season some of them being engaged from December to the 30th rangers up to the end of October. The rest has been satisfactory in the highest degree, the revenue having increased in the several agencies immediately after the inception of the system to the extent of from fifty per cent and in one agency even 400 per cent.

Instead of agents having with accounts for timber dues as formerly all the timber put out to be cut, cutting on special lots of land are checked and all accounts made up and transmitted to agents for the collection of the dues and transmission of the same to head quarters as collected.

Wood rangers have standing instructions to report early in any wanton or special waste, when such has been observed in connection with lumbering operations and in cases of licensees allowing standing pine timber which fire termed the "boring worm." A few cases of waste transpired some years ago by licensees arranging with jobbers to cut saw logs on their timber limits, the logs agreement to scale up to a certain standard of the standard fixed being rejected and left in the woods to save the rejected timber out of the returns but through wood rangers of the department, such transactions were abandoned when parties found that they had to account for and make payment

ng as in connection with the manufacture of square pine and board or octagonal pine timber especially the former, in squaring which and in the rejection of the upper portion of the tree where the limbs begin fully one third of the tree is wasted viz. one-sixth of the best of the timber in squaring off to reach the square, and one-sixth of the upper part of the tree which is left in the woods, but which if drawn would be valuable at a saw mill, where it could be cut into various qualities of lumber either fit for domestic use or export. The waste referred to has been noticed by this department for years past, but under the regulations past and present and the tenure under which licenses to cut timber are held and have been held for many years, it is found difficult to uproot a system which has obtained so long and in which there are so many vested interests and so much capital involved

Production of Timber in Canada, 1890

The following table taken from the Statistical Year Book of Canada (1891), p. 14, gives the production of timber in the whole of Canada during the year 1890

Timber	Ontario	Quebec	New Brunswick	British Columbia	Nova Scotia	Manitoba and N W T
Saw logs B.M.	522,524,288	490,449,000	98,569,122	79,177,055	**678,603,242	30,605,906
Square timber c ft.	3,392,625	2,151,791	16,618			
Boom ft pieces	150,361	5,240	7,375			
Hardwood, c ft	12,527	67,128	†			
Railway ties, No	672,410	139,550	79,488			‡‡
Cordwood, cords	29,971	6,747	1,356			
Telegraph poles	468	635	3,163			
Cedar, lin. ft.	162,346		4,716,201			
Cedar posts, tanbark and boats, cords	4,147	*10,769	258			
Pile timber, B. M	11,664					
Shingles, M		3,331	6,5			
Battens, knees, etc., No.		1,230	14,787			1,449,916
Posts and rails, No	*1,225		6,320			§,156,402
Staves, poles, etc., M			‡ 63			
Dues received, $	878,772	806,062	112,475	29,678		102,251

* Traverses. **Trans-Atlantic shipments only. †Included in square timber. ‡Rafting pins. ‡‡Pulp and bobbin wood included. §Laths.

The Ontario Fire Act

The following Act (Cap. 213 R.S.O.) was passed by the Legislature of Ontario in 1878, with the view of preventing the occurrence of the fires which have wrought so much devastation among the forests of the Province:—

An Act to preserve the Forests from destruction by Fire.

Preamble.

WHEREAS large quantities of valuable timber are annually destroyed by fires which are in many instances the result of negligence and carelessness, it is therefore necessary to provide stringent regulations for the prevention of such fires.

Therefore Her Majesty, by and with the advice and consent of the Legislative Assembly of the Province of Ontario, enacts as follows:—

Lt. Governor may proclaim a fire district.

1 The Lieutenant-Governor may, by proclamation to be made by him from time to time issued by and with the advice and consent of the Executive Council, declare any portion or part of the Province of Ontario to be a fire district.

Publication of fire district.

2 Every proclamation under this Act shall be published in the *Ontario Gazette* and such portion or part of the Province as is mentioned and declared to be a fire district in and by the said proclamation, shall from and after the said publication, become a fire district within the meaning and for the purposes of this Act.

Revocation.

3. Every such portion or part of the Province mentioned in such proclamation shall cease to be a fire district upon the revocation by the Lieutenant-Governor in Council of the proclamation by which it was created.

Fires not to be started except for certain purposes and in certain periods.

4 It shall not be lawful for any person to set out, or cause to be set out or started any fire in or near the woods within any fire district between the first day of April and the first day of November in any year, except for the purpose of clearing land, cooking, obtaining warmth, or for some industrial purpose, and in cases of starting fires for any of the above purposes, the obligations and precautions imposed by the following sections shall be observed.

Precautions to be taken in case of clearing land.

5 Every person who shall, between the first day of April and the first day of November, make or start a fire within such fire district for the purpose of clearing land shall exercise and observe every reasonable care and precaution in the making and starting of such fire, and in the managing of and caring for the same after it has been made and started, in order to prevent such fire from spreading or burning up the timber and forests surrounding the place where it has been so made and started.

Precautions in case of cooking, etc.

6. Every person who shall between the first day of April and the first day of November make or start within such fire district a fire in the forest, or at a distance of less than half-a-mile therefrom, or upon any island for cooking obtaining warmth, or for any industrial purpose, shall—

1 Select a locality in the neighbourhood in which there is the smallest quantity of vegetable matter dead wood branches brushwood dry leaves or resinous trees

2. Clear the place in which he is about to light the fire removing all vegetable matter dead trees branches brushwood and and dry leaves from the soil within a radius of ten feet from the fire

3. Exercise and observe every reasonable precaution to prevent such fire from spreading, and carefully extinguish the same before quitting the place

Penalty on persons using matches, burning substances etc

7 Any person who [illegible] ashes of a pipe lighted cigar or cigarette or [illegible] shall be subject to the penalties [illegible] The next [illegible] the fire of such match ashes [illegible] or wadding lighted fire arms or other burning substance

Act of employees to be reported by persons of survey parties

8. Every person in charge of any drive of timber survey or exploring party [illegible] coasting or other [illegible] shall [illegible] of which [illegible] to the Act [illegible] and [illegible] from [illegible]

Precautions to be taken

9 [illegible] the [illegible] and the [illegible] escape [illegible] from the furnace or ash pan of such [illegible] that [illegible] sparks of [illegible] or [illegible] or [illegible] or [illegible] right [illegible] the [illegible]

Duty of persons

10 [illegible] about [illegible] as are [illegible] as far as [illegible]

Penalty for non-compliance with Act

11 Whosoever [illegible] with the requirements of this Act [illegible] shall [illegible]

peace to a penalty not exceeding fifty dollars over and above the costs of prosecution, and in default of payment of such fine and costs, the offender shall be imprisoned in the common gaol for a period not exceeding three calendar months, and any railway company permitting any locomotive engine to be run in violation of the provisions of the ninth section of this Act shall be liable to a penalty of one hundred dollars for each offence, to be recovered with costs in any court of competent jurisdiction.

Time for bringing action.

12 Every suit for any contravention of this Act shall be commenced within three calendar months immediately following such contravention.

Disposal of fines.

13 All fines and penalties imposed and collected under this Act shall be paid one half to the complainant or prosecutor and the other half to Her Majesty for the public use of the Province.

Government agents to enforce this Act.

14 It shall be the special duty of every Crown Land agent, Woods and Forests agent, Free Grant agent, and bush ranger to enforce the provisions and requirements of this Act and in all cases coming within the knowledge of any such agent or bush ranger to prosecute every person guilty of a breach of any of the provisions and requirements of the same.

Act not to interfere with right of action for damages occasioned by fire.

15. Nothing in this Act contained shall be held to limit or interfere with the right of any party to bring and maintain action or actions for damages occasioned by fire and such right shall remain and exist as though this Act had not been passed.

DESCRIPTION OF "FIRE DISTRICTS" UNDER CAP. 213 OF THE STATUTES OF ONTARIO.

District No. 1.—Commencing at a point on the north shore of Lake Huron where Provincial Land Surveyor Albert P. Salter's meridian line between ranges numbers twenty one and twenty two west intersects the water's edge said point being the south-west angle of the Township of Plummer, thence easterly, following the turnings and windings of the shore along the water's edge of Lake Huron and the Georgian Bay to the south of French river, thence south-easterly, along the easterly shore of the Georgian Bay and taking in Parry Islands, to the north west angle of the Township of Matchedash, thence south easterly along the westerly boundaries of the Townships of Matchedash and North Orillia to the south west angle of North Orillia, thence north-easterly along the southerly boundary of North Orillia to the waters of Lake Couchiching, thence easterly across said Lake to the south-west angle of the Township of Rama, thence easterly along the south boundaries of the Townships of Rama, Dalton, Digby and Lutterworth to the north-west angle of the Township of Galway, thence southerly along the westerly boundaries of the Townships of Galway and Harvey to the south west angle of Harvey, thence easterly along the south boundaries of the Townships of Harvey, Burleigh, Methuen, Lake and Tudor to the north west angle of the Township of Eldon, thence southerly along the west boundary of

Elzevir to the south west angle of said township, thence easterly along the south boundaries of the Townships of Elzevir, Kaladar, Kennebec, Olden, Oso and South Sherbrooke to the south-east angle of the Township of South Sherbrooke, thence north-westerly along the easterly boundaries of the Townships of South and North Sherbrooke to the southerly boundary of the Township of Lavant, thence north-easterly along the southerly boundaries of the Townships of Lavant and Darling to the south-easterly angle of the Township of Darling, thence north-westerly along the easterly boundaries of the Townships of Darling and Bagot to the north-easterly angle of the Township of Bagot, [illegible] along the northerly boundary of the Township of [illegible] to the easterly boundary of [illegible] westerly along [illegible] Grattan, Wilberforce and [illegible] to [illegible] Ottawa River to [illegible] of Lake Temiscaming [illegible] the boundary between the Provinces of Ontario and Quebec, to the northern boundary of the Province of Ontario [illegible] Provincial Land Surveyor Albert P. Salter [illegible] between [illegible] twenty [illegible] and twenty-two west, and thence southerly along said meridian line produced to the place of beginning.

District No. [illegible] All that portion of the said Province lying west of Provincial Land Surveyor Albert P. Salter's [illegible] between ranges twenty-one and twenty-two west [illegible] District of Algoma and west of the said meridian line produced to the northern boundary of the Province, the said [illegible] the western boundary of the [illegible] District established by the Proclamation of March 27th, 1878.

THE ONTARIO FIRE-RANGING SYSTEM

In 1885 the Department of Crown Lands, Ontario, [illegible] system of fire-ranging [illegible] the cost of which [illegible] It is very generally [illegible] greatly reducing the annual loss through forest fires.

[illegible] The Commissioner of Crown Lands, feeling the importance of adopting some better organization for preventing the destruction of timber by fire, has approved of a scheme [illegible] which are herein stated [illegible] of its advantages.

It is proposed that [illegible] say from the first day of May [illegible] as are [illegible] to prevent and suppress fires in every way possible, and the ranger who is placed in charge [illegible] whatever help may be necessary [illegible] and instructed to post them up [illegible] to visit each person [illegible] and give them [illegible] a copy of the Act, explaining to them its provisions [illegible] and to endeavor to enlist their assistance and sympathy to make the Act effective.

The department will leave the limit holder to suggest the number of men who should be placed on his limit [illegible] all things necessary that prac-

tical bushmen of good judgment and well acquainted with the limit should be selected. he the limit holder will nominate the man to be placed in charge of the limit and his subordinates if any the department reserving the right to limit the number of men to be employed on any limit and also to reject or remove any man whom it finds unfitted to discharge the duties of the position.

It is hoped that limit holders will recognize the necessity of recommending men of good judgement and cool temper who while fully discharging their duties, will not harass or annoy settlers or others as if an animus is created in the breasts of the settlers the scheme will undoubtedly fail to effect the result expected. Limit holders will be expected to exercise supervision over these men and see that they thoroughly and effectually perform their duties.

With respect to remuneration the department thinks that the man in charge of a limit should be paid dollars a day, which should cover board and ordinary expenses, and where subordinates are required that suitable men can be obtained at dollars per day, which should also cover board and ordinary expenses the men will be appointed bush and fire rangers and instructed from here so as to clothe them with authority under section 14 of the Fire Act, and a copy of the instructions will be furnished each limit holder

As the limit holder is reaping a large proportion of the benefit it is intended that he should bear one-half of the cost of men and expenses which may be incurred under this scheme

The department will pay wages and expenses and charge to each limit holder his proportion, which will be a charge upon the limit and an account will be rendered at the close of the season when prompt payment must be made

Should you desire to avail yourself of this scheme you will at once address a letter to the department to that effect stating the limits you wish protected the number of your license for current season the number of men you would recommend to be employed and submit a list of those you would recommend for appointment on your limits.

AUBREY WHITE,
Assistant Commissioner

DEPARTMENT OF CROWN LANDS,
(WOODS AND FOREST BRANCH,)
April, 1888.

AN ACT RESPECTING THE ROCKY MOUNTAINS PARK OF CANADA.

Chap. 12 of 7-8 Edw. VII. Act to set apart a national park of land in the Rocky Mountains reads thus:—

Whereas it is expedient in the public interest that a national park and pleasure ground should be set apart and established in the North-west Territories: Therefore His Majesty, by and with the advice and consent of the Senate and House of Commons of Canada, enacts as follows:—

1. The tract of land in the Dominion of Canada, that is to say, commencing at the intersection of the western boundary of the Canadian Pacific Railway as shown on a plan of right-of-way filed in the Department of Railways and Canals by the Canadian Pacific Railway Company [illegible] to a point [illegible] of a [illegible] thence [illegible] the place of commencement, containing by admeasurement two hundred and sixty [illegible] square miles, more or less, shown as the Rocky Mountains Park of Canada on a plan of survey thereof filed in the Department of the Interior, is hereby withdrawn from sale and settlement, and shall not be open for entry under the Dominion Lands Act or any regulations made under the said Act or any other Act with respect to mining or timber licenses or any other matter whatsoever.

2. The said tract of land is hereby reserved and set apart as a public park [illegible] subject to the provisions of this Act and of the regulations hereinafter mentioned, and shall be known as the Rocky Mountains Park of Canada.

3. No person shall, except as hereinafter provided, locate, [illegible] use or occupy any portion of the said public park.

4. [illegible] of the [illegible] purposes.

[illegible] water-[illegible] matters [illegible] contained.

[illegible] of the [illegible] agreement and [illegible] every such respect.

(c) The lease for any term of years of such parcels of land in the park as he deems advisable in the public interest, for the construction of buildings for ordinary habitation and purposes of trade and industry, and for the accommodation of persons resorting to the park.

(d) The working of mines and the development of mining interests within the limits of the park, and the issuing of licenses or permits of occupation for the said purposes; but no lease, license or permit shall be made, granted or issued under this or the next preceding paragraph of this section which will in any way impair the usefulness of the park for the purposes of public enjoyment and recreation.

(e) Trade and traffic of every description.

(f) The preservation and protection of game and fish of wild birds generally, and of cattle allowed to pasture in the park.

(g) The issuing of licenses or permits for the pasturage of cattle, and the management of hay lands.

(h) The removal and exclusion of trespassers.

(i) And generally for all purposes necessary to carry this Act into effect according to the true intent and meaning thereof.

(2) The Governor-in-council may by the said regulations impose penalties for any violation thereof not exceeding in each case the sum of fifty dollars, or, in default of payment with costs, imprisonment for not more than three months.

5 Every regulation made as aforesaid, shall, after publication for four consecutive weeks in the *Canada Gazette* and in any other manner that may be provided thereby by the Governor-in-council have the like force and effect as if it was herein enacted and such regulations shall be laid before Parliament within fifteen days after its first meeting thereafter.

6 Nothing in this Act contained shall affect the obligations of the Government (if any) arising out of the conditions of the acquisition of the North-west Territories.

7 This Act may be cited as "Rocky Mountains Park Act, 1887."

Regulations Respecting Rocky Mountains Park

By Order-in-Council of Monday 30th June 1890 under authority of "The Rocky Mountains Park Act, 50-51 Vict. c. 32, s. 4, the Order in Council of the 27th day of November 1889 establishing regulations for the control and management of the Rocky Mountains Park of Canada was cancelled, and the following Regulations, approved in point of form by the Minister of Justice, were substituted after the 1st day of July 1890 for the regulations established by the said Order in Council.

(1) No person shall, without permission from the Minister of the Interior, reside permanently within other portions of the park than those sold or leased.

(2) The superintendent of the park (hereinafter called the superintendent) may issue permits to visitors for camping upon such ground as he may designate; any one camping without such permit shall be considered a trespasser and the fee for such permit shall be one dollar per month per tent; provided however that no such permit shall be granted for camping in any portion of the park situated south of Bow River.

(3) The [illegible] of any of the natural [illegible] of [illegible] whatsoever into any of the springs or streams in the Park.

(4) No [illegible] the Minister of the Interior shall be posted or displayed within the park, except on leased property [illegible]

(5) No live stock shall be permitted to run at large, nor shall pigs, sheep or [illegible] be slaughtered for food p[illegible]

(6) The superintendent shall from time to time [illegible] within the park, upon which [illegible] may pasture not in excess of two milch cows and two horses for each lot [illegible]sed but [illegible]ders availing themselves of this regulation shall make [illegible]ry to the superintendent for herding the animals and driving them to and f[illegible] the pasture grounds.

(7) All stock found pasturing, except where authorized, may be impounded [illegible] Minister of the Interior.

(8) The superintendent shall, upon application, furnish each owner of a dog [illegible] be renewed, and any unlicensed dog or bitch may be impounded or dest[illegible] at the discretion of the superintendent.

(9) No person shall cut or remove any timber, growing or dead, or remove [illegible] sion of the superintendent.

(10) No rubbish or any matter of an offensive nature shall be deposit[illegible] except in such places and at such times and under such cond[illegible]ns as the superintendent shall designate.

(11) No person shall ride or drive on or over any bridge within the park faster [illegible]

(b) No person shall ride or drive across or on any side-walk, boulevard [illegible] set apart for the purpose by the superintendent.

[illegible] without being tied or in charge of some grown person.

(12) The waters of [illegible] from any [illegible]

distribution of the said water

(14) The Minister of the Interior shall have power to cause such

and purposes of trade and industry and for the

orting to the park and may issue leases for such lots for any term not ex

Interior

(18) No bar-room or saloon shall be permitted within the park

superintendent

permit

more than three dollars for any day not exceeding ten hours

3) The Minister of the Interior may a license to any person or persons undertaking to place a steam yacl r vessel, or vessels, suitable for the conveyance of passengers, and in all respects complying w the Steamboat Inspection Act or Acts regulating steam and otl r vessels, on any waters

le horses shall not exceed the follows

miles of the railway station, one dollar

(*b*) For the conveyance of one passen r when there are at least four passengers in the vehicle, from any one p within one mile of the Bow River bridge, at the end of Banff avenue to and from Devil's Lake two dollars

each additional passen

(*d*) For any vehicle drawn by two or more horses and ts an hour for each person for the first hour, twenty-five cents an hour for every subsequent hour

(*e*) For conveyance in any vehicle drawn by one horse, one dollar an hour for the first hour, and fifty cents for each person for every subsequent hour

twenty-five cents may be charged for each subsequent hour

to agreement between the parties interested

25) The tires on waggons used for freighting purposes on the roads

a half in width all vehicles shall be provided with brakes and it shall be the duty of the superintendent to control and prohibit the use of any vehicle which in his opinion is unsafe

(6) All drivers of public vehicles shall be licensed, the fee therefor shall be one dollar and such license may be revoked and cancelled at any time by the superintendent if it appears to his satisfaction that the holder thereof has been guilty of incivility, insolence or misconduct while engaging in duties.

(7) No person shall keep a pool billiard or bagatelle table or bowling alley for use by the public without a license and the fee for the year from the first day of May in each year and the fees for such license shall be the following:

(a) For every such pool table twenty dollars and for a billiard table ten dollars

(b) For one bagatelle, Mississippi, pigeon hole or other table or board with pins, twenty dollars and for every additional table ten dollars

(c) For a bowling alley, ten dollars

28. Every description of swing and all games of faro, craps, dice or other games of chance or tests of skill or games of cards and all betting and wagering on any such games of chance are strictly prohibited within the park and no person shall play at or allow to be played on his premises or assist or be engaged in any way in any such unlawful gaming, as aforesaid.

29. The shooting at or killing, capturing or taking in any manner injuring any wild animal or bird within the park is hereby prohibited, excepting however certain species known as noxious animals, wolves and hawks. Fishing with nets in any of the waters of the park is also prohibited.

30. The guns of all persons found hunting or fishing within the park having in their possession any game killed within the park in contravention of clause 29 of these regulations shall be seized and confiscated.

31. Persons desiring to cut hay within the park shall be directed from the superintendent and shall be subject at all times to his supervision and control.

32. No person shall take or use any stone, sand, gravel or other material in the park without a permit from the superintendent and the following fees shall be paid to the superintendent for such materials:—

Sand	10 cents, per load
Stone	25 " "
Gravel	25

33. Persons desiring to burn lime or manufacture brick within the park shall obtain a permit from the superintendent defining the location of the kiln or brick yard and a royalty of ten cents and a half per bushel for all lime burnt and for all brick manufactured at five per thousand to be fixed by the Minister of the Interior.

(34) The use of fire arms within the park, except under permit from the superintendent, is strictly prohibited.

(35) In any offence committed in contravention of the provisions of these regulations such offence shall be prosecuted under the Summary Convictions Act before the superintendent of the park who for the purposes hereof shall be ex officio a justice of the peace with jurisdiction anywhere within the park or before any officer of the North West mounted police force empowered by law to sit and act as a justice of the peace.

36. Except as hereinafter specially provided every one who violates any provision of any of these regulations shall be liable to a penalty not exceeding

not exceeding one month

(37) Every one who violates any of the provisions of clause number

the person laying the information

ght of these regulations, every officer of the park, or officer of the North-west mounted police force, or constable of the

towards the revenues of the park in a manner hereinafter provided

livery-stable within the park

behalf shall be in force

person who may hereafter be so appointed to the said office

Mineral Lands in the Park

The following Order-in-Council was adopted 12th October, 1892 respecting mineral lands within the Park:—

and not exceeding in all sixty years

agreed upon by the government and licensee.

in advance

amount paid for rent shall be credited to such royalty

license without the consent in writing of the Minister of the Interior

planes or lines in which their surface boundaries lie

that behalf by the Governor-in-Council

THE ADIRONDACKS

Forest Legislation

A desolation like that which has overwhelmed many once beautiful and [illegible] unless prompt measures are taken to check the action of destructive causes [illegible] still the proprietor of extensive forests. Wood lands which have [illegible] ful economy of private forests

Fortunately for the immense economical and sanitary interests involved in this branch of rural and industrial husbandry, public o[illegible] thoroughly roused to the importa[illegible] of the subject. Plantations of a certain extent have been made and a[illegible] system is pursued in the treatment of the remaining native woods

The p[illegible] the far west have thrown themselves into the work with much [illegible] and made such legal provisions and appropriations as to render the [illegible] tions effectual. The hands that built the Pacific Railway at the [illegible] belts of trees to [illegible]

[illegible] that the legislature of the State of New York turned its [illegible] of Lewis, Essex, Clinton, Franklin, St. Lawrence, Herkimer, and [illegible] as the "park commission" made a report recommending that no more lands lying in the counties named should be sold, but that as lan[illegible] the State through tax sales, t[illegible] should be held for future forest manage[illegible] The methods recommended by the commission were not acted upon until 1885 [illegible] the Act, and also in the counties of Saratoga and Warren. During the interval the sale of State lands had been continued, and in 1883 the State had a [illegible] mendations contained in the commission's report as soon as they were made [illegible]

comptroller in January 1885 and in forwarding their report to the legislature Comptroller Chapin said "The problem in its fulness affects the welfare of many sister commonwealths and of the nation at large. It is eminently fitting that in its solution the Empire State should lead the way"

As a sequel to and the result of the recommendations of the Comptroller's Committee, the Bill establishing the Forest Commission was passed in the following May, as follows:—

THE FOREST COMMISSION ACT

Chapter 283, Laws of 1885, as subsequently amended.

An Act to establish a Forest Commission and to define its powers and duties, and for the preservation of forests, passed May 15th, 1885

The people of the State of New York, represented in Senate and Assembly, do enact as follows

Commissioners How Appointed

Section 1 There shall be a forest commission, which shall consist of three persons who shall be styled forest commissioners and who may be removed by the governor for cause The forest commissioners shall be appointed by the governor by and with the advice and consent of the Senate

Terms by Lot

§ 2. At the first meeting of the forest commission they shall divide themselves by lot, so that the term of one shall expire in two years, one in four years and one in six years from the first day of February next ensuing Except as to the three terms of office thus determined, the term of office of a forest commissioner shall be six years from the first day of February on which the preceding term expires

How Appointed After 1888.—Vacancies.

§ 3. During the month of January in the year 1888, and in every second year thereafter, the governor by and with the advice and consent of the Senate shall appoint one forest commissioner Vacancies that may exist in the office of a forest commissioner after the commencement of a term of office shall be filled by the governor's appointment, subject to the confirmation of the Senate at its next session for the unexpired portion of the term in which the vacancy occurs.

Commissioners, Compensation of

§ 4. The forest commissioners shall serve without compensation, except that there shall be paid them their reasonable expenses incurred in the performance of their official duties

Employees and Pay of

§ 5. The forest commission shall have power to employ a forest warden, forest inspectors, a clerk, and all such agents as they may deem necessary, and to fix their compensations, but the expenses and salary of such warden, agents, clerk, inspectors, and assistants, shall not exceed in the aggregate with the other expenses of the commission the sum therefor appropriated by the legislature.

Rooms, Etc.

§ 6 The trustees of public buildings, under Chap. 349 laws of 1883, shall provide rooms for office for the forest commission with proper furniture and fixtures and with warming and lights

FOREST PRESERVE DEFINED

§ 7. [illegible] lands not w[illegible]ands as have been, or may hereafter be, acquired by the State of [illegible]

EXCHANGED. APPRAISERS APPOINTED. DUTY OF COMPTROLLER.

§ 8. [illegible]ereafter constituting the forest preserve shall be [illegible] shall [illegible] thereon, to such person or persons, corporation or association as shall have offered the highest price therefor, but no [illegible] parcels of land or the timber [illegible] lands proposed to be [illegible] county shall nominate and appoint each one appraiser. The two appraisers [illegible]inted shall [illegible] ing great blocks of the forest preserve now owned by the State

Forests to be Protected and Promoted. Powers of Land Office and Comptroller Transferred to Forest Commission. Rules Governing Forest Preserve

§ 9. The forest commission shall have the care, custody, control and superintendence of the forest preserve. It shall be the duty of the commission to maintain and [illegible] the forests now on the forest preserve, and to promote as far as practicable the further growth of forests thereon. It shall [illegible] have charge of the public interests of the State with regard to forest and tree planting, and especially with reference to forest fires in every part of the State. It shall have [illegible] the forest preserve [illegible] the provisions of this act all the powers now vested in the [illegible] the [illegible] [illegible] and may from time to time make [illegible] part of the forest preserve, and for its [illegible] such rules or regulations [illegible] prevent the [illegible] [illegible] any law ful business.

Officers may Arrest, when

§ 10. The forest warden, forest [illegible] and other persons acting upon the forest preserve under the written [illegible] of the forest commission may without warrant arrest any person found upon the forest preserve violating any of the provisions of this act [illegible] the person so [illegible] the arrest [illegible] the nearest magistrate [illegible] magistrate shall act as the case may require.

Actions to Recover Damages and for Trespass. Trespass Defined. Attorneys, How Employed.—Under Direction of Attorney-General

§ 11. The forest commission may bring in the name of and in behalf of the people of the State of New York any action [illegible] to the forest preserve or trespass thereon, to recover damages [illegible] trespass to recover [illegible] forming part of the forest preserve [illegible] by persons not entitled thereto [illegible] maintenance of the forest preserve [illegible] The forest commission may also maintain in the name of [illegible] of the people of the State an action for the trespass [illegible] [illegible] the forest preserve. It [illegible] [illegible] of the [illegible] preserve. The trespass [illegible] act of cutting or [illegible] any tree or timber [illegible] within the forest preserve [illegible] bark [illegible] such tree or timber or any part thereof or bark [illegible] from the said forest preserve. With the consent of the attorney-general and the comptroller the forest

commission may employ attorneys and counsel to prosecute any such action, or to defend any action brought against the commission or any of its members or subordinates arising out of their or his official conduct with relation to the forest preserve. Any attorney or counsel so employed shall act under the direction of and in the name of the attorney general. Where such attorney or counsel is not so employed the attorney general shall prosecute and defend such actions.

INJUNCTIONS.

§12. In any action brought by or at the instance of the forest commission an injunction either preliminary or final shall upon application be granted restraining any act of trespass waste or injury to the forest preserve.

PARTITION ACTION TO HOLD BUT LEASE OF AGREEMENT FOR

§13. Whenever the State and any person or persons are interested with any person in any land within the [illegible] of this act or in any possession taken or to be taken under or by virtue of this act or in any action or proceeding relating thereto, the attorney general shall, upon the request of the forest commission, bring an action in the name of the people of the State of New York for the partition of such lands according to the respective rights of the persons interested therein and upon the consent in writing of the forest commission shall also bring and maintain an action for the recovery of the possession of any such lands or any right to or interest in the same or any part thereof. In all such actions and proceedings the rights of the State shall be represented by the attorney general and the practice and proceedings therein shall be the same as if the State were not entitled to exemption from all process in such actions and proceedings. Upon the application for the commencement of any such action, the forest commission shall cause to be filed in the land office a description of the lands to be affected by such action, and thereafter no person shall acquire any right, title or interest in or to any of such lands by virtue of any possession taken or improvement made thereon, except that in case of settlement thereon prior to the filing of such description, the settler may within sixty days thereafter acquire the right to purchase the same from the State. Where any person or persons who have made settlement upon any of such lands shall have complied with the requirements of law in relation to the purchase of state lands, and shall have been prevented from completing the purchase by the commencement of any such action by the State, the court may direct the completion of the purchase by the State, and may cause the necessary papers to be executed and delivered for that purpose, and may direct the payment of the purchase money and interest out of the proceeds of the sale of the land, as now provided by law in case of voluntary conveyances executed by the commissioners of the land office.

INCOME.

§14. All moneys received by the forest commission from the sale of timber or other forest products shall be paid over by the forest commission to the treasury of the State.

EXPENSES.

§15. All expenditures made by the forest commission for which accounts shall be rendered by the forest commission shall be reported annually to the legislature.

ANNUAL REPORT.

§16. The forest commission shall on January first of every year make a report to the legislature of its proceedings together with such recommendations of further legislative or official action as they may deem proper.

SUPERVISORS PROTECTORS OF STATE LANDS EXCEPT IN FOREST PRESERVE. DUTY OF DISTRICT ATTORNEY.—SUPERVISORS TO REPORT.—DISTRICT AND FOREST GUARDS.

§17. The supervisor of every town in this State in which wild or forest lands belonging to the State are located except within the counties mentioned in section seven of this act, shall be by virtue of his office the protector of these lands subject to the instruction he may receive from the forest commission. It shall be his duty to report to the district attorney for prosecution any act of spoliation or injury that may be done and it shall be the duty of such district attorney to institute proceedings for the prevention of further trespass, and for the recovery of all damages that may have been committed with costs of prosecution. The supervisors shall also report their proceedings therein to the forest commission. In towns where the forest commission shall deem it necessary, they may serve a notice upon the supervisor requiring him to appoint one or more forest guards, and if more than one in a town the district of each shall be properly defined. The guard so appointed shall have such power, and perform such duties, and receive such pay as the forest commission may determine.

INSTRUCTIONS IN FORESTRY IN SCHOOLS.

§18. The forest commission shall take such measures as the department of public instruction, the regents of the university and the forest commission may approve for awakening an interest in behalf of forestry in the public schools academies and colleges of the State and of imparting some degree of elementary instruction upon this subject therein.

METHODS OF PUBLIC INSTRUCTION.

§19. The forest commission shall as soon as practicable prepare tracts or circulars of information giving plain and concise advice for the care of woodlands upon private lands and for the starting of new plantations upon lands that have been denuded, exhausted by cultivation, eroded by torrents, or injured by fire, or that are sandy, marshy, broken, stony or waste and unfit for other use. These publications shall be furnished without cost to any citizen of the State upon application, and proper measures may be taken for bringing them to the notice of persons who would be benefited by this advice.

SUPERVISORS TO ACT AS FIREWARDENS, WHEN.—DISTRICT MAPS.—FIREWARDENS PAID BY TOWNS. FIREWARDENS IN FOREST PRESERVE.—AUTHORITY OF FIREWARDENS.

§20. Every supervisor of a town in this State, excepting within the counties mentioned in section seven of this act, shall be *ex-officio* firewarden therein. But in towns particularly exposed to damages from forest fires, the supervisor may divide the same into two or more districts, bounded, as far as may be by roads, streams of water, or dividing ridges of land or lot lines and he may in writing, appoint one resident citizen in each district as district firewarden therein. A description of these districts, and the names of the district firewardens thus appointed, shall be recorded in the office of the town clerk. The supervisor may also cause a map of the fire district of his town to be posted in some public place with the names of the district firewardens appointed.

The cost of such map, not exceeding five dollars, shall be made a town charge, and the services of the firewardens shall also be deemed a town charge, and shall not exceed the sum of two dollars per day for the time actually occupied in the performance of their duties as such firewardens. The compensation for services of the persons who may assist in extinguishing forest fires, shall be a town charge, and shall not exceed the sum of one dollar per day for each person employed, but all bills for such services must be approved by the firewarden of the town in which the fire occurred before payment shall be made. It shall be the duty of the board of auditors in each town to examine, audit and allow promptly all reasonable bills presented to them for services and disbursements under this section. Within the counties named in section seven of this act, such persons shall be firewardens as may from time to time be appointed by the forest commission. The persons so appointed shall act during the pleasure and under the direction of the forest commission, and there shall be applicable to them all the provisions of this act, with reference to supervisors and district town wardens. Upon the discovery of a forest fire, it shall be the duty of the firewarden of the district, town or county to take such measures as shall be necessary for its extinction. For this purpose he shall have authority to call upon any person in the territory in which he acts for assistance, and any person shall be liable to a fine of not less than five nor more than twenty dollars for refusing to act when so called upon.

Officers, Powers and Duties of, in Case of Fire.

See Revised Statutes, Chap. 20, title 14, Part 1, Vol. 3, p. 2086.

§ 21. The forest commission, the forest warden, inspectors, the foresters, and any other person employed by or under the authority of the forest commission, and who may be authorized by the commission to assume such duty, shall within the counties mentioned in section seven of this Act, whenever the woods in any such town shall be on fire, perform the duties imposed upon, and in such case shall have the powers granted to the justices of the peace, the supervisors, and the commissioners of highway of such towns, by title fourteen, chapter twenty, of part one, of the revised statutes, with reference to the ordering of persons to assist in extinguishing fires or stopping their progress, and any person so ordered by the forest commission, the forest warden, the forest inspectors, the foresters, or any of them, or any other person acting or authorized as aforesaid, who shall refuse or neglect to comply with any such order, shall be liable to punishment prescribed by the said title.

No Action for Trespass, When.

§ 22. No action for trespass shall be brought by any owner of land for entry made upon his premises by persons going to assist in extinguishing a forest fire, although it may not be upon his land.

Privilege, Case of Fire.

§ 23. The fire-warden or the supervisor where acting in general charge, may cause fences to be destroyed or furrows to be ploughed to check the running of fire, and in cases of great danger back fires may be set along a road or stream or other line of defence, to clear off the combustible material before an advancing fire.

REPORTS OF SUPERVISORS AND FIREWARDENS. SUMMARY TO BE REPORTED TO LEGISLATURE.

§ 24. The supervisor of every town of which he is firewarden as aforesaid, and in which a forest fire of more than one acre in extent has occurred within a year shall report to the forest commission the extent of the area burned over, to the best of his information, together with the probable amount of property destroyed specifying the value of timber as near as may be and amount of cordwood, logs, bark or other forest product, and of fencing, bridges and buildings that have been burned. He shall also make inquiries and report as to the causes of the fires if they can be ascertained and as to the measures employed and found most effectual in checking their progress. A condensed summary of these returns by counties, and of the information as to the same matter otherwise gathered by the forest commission, shall be included in the annual report of the forest commission.

WHAT RAILROAD COMPANIES MUST DO.—REMOVE GRASS, ETC.

§ 25. Every railroad company whose road passes through waste or forest lands, or lands liable to be over run by fires within this State, shall twice within each year cut and burn off or remove from its right-of-way all grass, bush, or inflammable material, but under proper care, and at times when the fires thus set are not liable to spread beyond control.

LOCOMOTIVES.—SPARK ARRESTERS. ENGINEERS AND FIREMEN.

§ 26. All locomotives which shall be run through forest lands shall be provided within one year from the date of this Act, with approved and sufficient arrangements for preventing the escape of fire from their furnace or ash-pan and netting of steel or iron wire upon their smoke stack to check the escape of sparks of fire. It shall be the duty of every engineer and fireman employed upon a locomotive to see that the appliance for the prevention of the escape of fire are in use and applied, as far as it can be reasonably and possibly done.

NOT TO DEPOSIT ASHES, AND TO REPORT FIRES.

§ 27. No railroad company shall permit its employees to deposit fire, coals or ashes upon their track in the immediate vicinity of wood lands liable to be overrun by fire, and in all cases where any engineers, conductors, or trainmen, discover that fences along the right-of-way, on woodlands adjacent to the railroad, are burning or in danger from fire, it shall be their duty to report the same at their next stopping place and the person in charge of such station shall take prompt measures for extinguishing such fires.

RAILROAD COMPANIES.—IN CASE OF FIRE.

§ 28. In season of drought, and especially during the first dry time in the spring after the snows have gone and before vegetation has revived, the railroad companies shall employ a sufficient additional number of trackmen for the prompt extinguishment of fire. And where a forest fire is raging near the line of their road they shall concentrate such help and adopt such measures as shall most effectually arrest its progress.

RAILROAD COMPANIES. PENALTY FOR NEGLECT.

§ 29. Any railroad company violating the provisions or requirements of this Act shall be liable to a fine of one hundred dollars for each offence

RULES OF COMMISSION TO BE POSTED.

§ 30. The forest commission shall, with as little delay as practicable, cause rules for the prevention and suppression of forest fires to be printed for posting in school-houses inns saw mills and other wood-working establishments lumber camps and other places in such portions of the State as they may deem necessary Any person maliciously or wantonly defacing or destroying such notices, shall be liable to a fine of five dollars. It shall be the duty of forest agents, supervisors, and school-trustees, to cause these rules, when received by them, to be properly posted, and replaced when lost or destroyed

INCENDIARIES. PENALTIES.

§ 31. Any person who shall wilfully or negligently set fire to, or assist another to set fire to any waste or forest land belonging to the State or to another person, whereby the the said forests are injured or endangered, or who suffers any fire upon his own lands to escape or extend beyond the limits thereof, to the injury of the wood lands of another or of the State, shall be liable to a fine of not less than fifty dollars, nor more than five hundred dollars or to imprisonment of not less than thirty days nor more than six months. He shall also be liable in an action for all damages that may be caused by such fires such actions to be brought in any court of this State having jurisdiction thereon.

APPROPRIATION

§ 32. Fifteen thousand dollars is hereby appropriated out of any moneys in the treasury, not otherwise appropriated, for the purposes of this act. And no liabilities shall be incurred by said forest commissioners in excess of this appropriation

§ 33. This Act shall take effect immediately

CHAPTER 37 —LAWS OF 1890

AN ACT TO AUTHORIZE THE PURCHASE OF LANDS LOCATED WITHIN SUCH COUNTIES AS INCLUDE THE FOREST PRESERVE.

The people of the State of New York, represented in Senate and Assembly, do enact as follows

Section 1. The forest commission, with the approval and concurrence of the commissioners of the land office, may purchase lands so located within such counties as include the forest preserve as shall be available for the purposes of a State park, at a price not to exceed one dollar and fifty cents, such approval and concurrence to be endorsed on a copy of the resolution of the said forest commission authorizing such purchase and certified to by the clerk of said commissioners of the land office.

§ 2. The forest commission may have such lands appraised by one or more appraisers, not to exceed three in number to be appointed by that commission. The expenses of such appraisal shall be a per diem allowance to the appraisers, not to exceed three dollars per day for the time actually employed and the necessary expenses incurred in each case, such expenses to be audited by the comptroller and paid out of the funds appropriated by the Legislature for the purposes of this act; but no purchase of lands shall be made in excess of previous appropriations for that purpose.

§ 3. The sum of twenty five thousand dollars or so much thereof as may be necessary is hereby appropriated out of any moneys in the treasury, not otherwise appropriated for the purpose of this Act, and no liabilities shall be incurred by said forest commission in excess of this appropriation.

§ 4. This Act shall take effect immediately.

In returning the foregoing bill to the legislature with his signature, the governor filed therewith the following memorandum:

STATE OF NEW YORK

Executive Chambers, Albany, March 11, 1890.

Memorandum filed with Senate Bill No. 91, entitled "an Act to authorize the purchase of lands located within such counties as include the forest preserve."

Approved. There is no objection to this Act. The criticism which possibly may be urged against it is that it is good enough so far as it goes, but that it is wholly inadequate to meet the requirements of the situation. It is not a broad and comprehensive measure providing for the establishment of an Adirondack park such as is imperatively demanded by the best interest of the State, but is simply a slight step in the right direction. The authority conferred is very inadequate, the amount appropriated is quite limited, the restrictions upon the prices to be paid are likely to produce unsatisfactory results, the provisions in regard to apportionment of lands are incomplete and somewhat unnecessary, and in many other respects the measure falls short of what it was hoped the legislature might enact. The bill must be regarded as a mere temporary expedient, and, as such, can do no harm; and although it will not afford a proper and complete solution of the Adirondack Park question, it encourages the hope that in the near future a more substantial and adequate measure may be passed to fully accomplish the object recommended in my recent message to the legislature relating to this subject.

I cheerfully approve the bill in the expectation that its enactment may lead to such a result.

DAVID B. HILL.

CHAPTER 556.—LAWS OF 1890

AN ACT FURTHER TO AMEND CHAPTER FOUR HUNDRED AND TWENTY SEVEN OF THE LAWS OF EIGHTEEN HUNDRED AND FIFTY FIVE, ENTITLED "AN ACT IN RELATION TO THE COLLECTION OF TAXES ON LAND OF NON-RESIDENTS, AND TO PROVIDE FOR THE SALE OF SUCH LAND FOR UNPAID TAXES."

The people of the State of New York, represented in Senate and Assembly, do enact as follows:

Section 1. Section seventy-four of chapter four hundred and twenty-seven of the laws of eighteen hundred and fifty-five, entitled "An Act in relation to the

collection of taxes on the lands of non residents and to provide for the sale of such lands for unpaid taxes as amended by chapter four hundred and fifty three of the laws of eighteen hundred and fifty is hereby further amended so as to read as follows

§ 14 The occupant of any such lot, or any other person, may, at any time before the service of said notice by the purchaser or the person claiming under him and within three years from the expiration of the two years allowed by law for the redemption thereof redeem any land so occupied by filing in the office of the comptroller satisfactory evidence of the occupancy required and by paying to him the consideration money for which the land to be redeemed was sold and twenty seven and one half per centum thereon together with the sum paid for the deed if any and such amount as may have been paid to the State for all subsequent taxes thereon or for the redemption from subsequent tax sales thereof and all costs thereto pertaining such lot has been legally exempt from taxation for one or more years subsequent to the sale in question of a sum that will represent the gross amount of taxes and interest that would have been due thereon provided it had been taxed during each of the years it may have been exempt on its assessed valuation and at the rate per cent of taxation thereon for the year when last returned to the comptroller's office In all cases of tax sales heretofore made by the comptroller where the land sold was in the actual occupancy of any person at the expiration of the two years allowed for the redemption thereof and the purchaser or the persons claiming under him shall have failed to serve notice of such sale upon the occupant or occupants thereof and to file evidence of such service in the comptroller's office as provided by section sixty seven of this Act and the occupant or any other person shall fail to file in the comptroller's office within one year after this Act shall take effect a written notice of such occupancy together with an application for the redemption of such lands and to furnish the comptroller with satisfactory evidence of the occupancy required and make such redemption within two years after this Act shall take effect then and in all such cases the said tax sales of such land and the conveyances thereof by the comptroller shall become absolute and the occupant and occupants and all other persons interested in the said land, shall be forever barred from all right and title thereto.

§ 2 All Acts and parts of Acts inconsistent with this Act are hereby repealed

§ 3 This Act shall take effect immediately

FIREWARDENS

The organization of the force of firewardens in the State of New York has not been effected without considerable care as it has required the careful consideration of 281 separate appointments

In maintenance of the system it has also a large amount of office work in the way of correspondence and in forwarding to each fireward the necessary packages of posters rules and other supplies In addition to the 281 firewards in the counties of the forest preserve there are the 44 supervisors in the other counties who are firewards ex officio with each of whom a correspondence is maintained

No salary is attached to the position of fireward, but the commission has succeeded in securing the services of citizens intelligent men who have shown themselves equal to the responsibilities devolving upon them and have evinced a

zeal and efficiency which argues well for the future care and preservation of our forest lands.

Each firewarden when appointed is furnished with a warrant bearing the signature and seal of the Department.

This warrant reads as follows

STATE OF NEW YORK.

THE FOREST COMMISSION, ALBANY, N Y 189

Esq.

Town of County of

The Forest Commission hereby appoints you a firewarden in and for your town in accordance with the provisions of the "Act to establish a Forest Commission" etc., passed May 15, 1885

It will be your duty as firewarden whenever a forest fire occurs within the limits of your town, whether it be on State or other lands, to promptly notify a sufficient force to assist you, to go to the place where the fire is burning and to take charge of and to direct the work necessary for extinguishing it. All persons in the territory whom you may order to render you such assistance are required by law to obey your order and any person who may refuse to act in obedience to your order is by statute liable to a fine of not less than five nor more than twenty dollars.

If a forest fire occurs in your vicinity, although it may be in the adjoining town it will be as much your duty to go immediately to the place of such fire as if it were in your own town, and, in the absence of the fire warden of the town within the limits of which such fire may be to assume the same authority and to discharge the same duties that you are empowered to assume and discharge in your own town, until the arrival of the fire warden of that town, upon which you will turn over all charges of the fire to him.

The same diligence and exertion must be used for the extinction of forest fires on private lands as on lands of the State The public welfare requires that all forests should be protected from fire, no matter to whom they may belong

After a forest fire has occurred in your town you must make a report of the same to the forest commission stating the date and place of the fire, the number of acres burned over the amount and nature of the damage and the cause of the fire if known.

Your attention is called to the provisions of the twentieth section of the Forest Commission Act, for dividing your town into fire districts. Action thereon, is left to your own discretion but if taken, you should report it to the commission.

It is essential that the rules and regulations of this commission governing the methods of preventing and extinguishing forest fires, should be made fully known to the public To that end you will be required to post and keep posted, the cards containing the printed rules throughout your town conformably to the provisions of section 30 of the before mentioned Forest Commission Act and wherever you may judge it to be necessary in order to accomplish a complete public notification Such posted cards as may at any time be missing shall be replaced at once. The cards will be furnished to you, and you can always be supplied with them on application to the commission.

A fire warden is required by law to be a resident of the town for which he is appointed If you do not reside in the town, herein named or if you should hereafter change your residence to another town please notify this commission at once.

The office of a firewarden is distinct from that of a forester. Firewardens are not required to discharge any duties except those necessary for the prevention and extinction of forest fires as before explained and such other duties for a like purpose as may be from time to time assigned to them by this commission.

It is provided, by statute that the pay of a firewarden for his official services shall not exceed the sum of two dollars a day for the time that he may be actually employed and also, that the bills of firewardens shall be paid by their respective towns. You are to render all your bills for services to your town and if you have any difficulty in having such bills audited and paid you should notify the forest commission.

This appointment is tendered to you in reliance upon a recommendation in which the commissioners place confidence. Should you accept the appointment, you are expected to discharge the duties of your office faithfully in full compliance with the letter and spirit of the forest commission Act and of the rules of the commission both of which you are asked to read carefully, and in a manner at once honorable to the forest commission and yourself.

Be kind enough to inform the commission immediately whether you accept or decline your appointment, and in case that your acceptance is not forwarded within thirty days from date, you will be understood as declining.

By order of the Forest Commission
(L.S.) Secretary

Rules and Regulations.

These are printed on heavy cards 12x15 inches. Latterly they have been printed on white linen as this material has proved more durable the most of the placards being posted in the woods or on fences, school houses and mills where they are exposed to the weather. Over 15,000 of these rules have been posted by the foresters and firewardens throughout the preserve counties, and the commission believes that much of the immunity from fire is due to their general distribution. They have been an important aid in warning the careless, and in educating the people in this particular.

Much of the force and value of these regulations is lost because there is no penalty attached to their violation, and the commission is not authorized to add any clause in this respect.

Rules for the Prevention and Suppression of Forest Fires and for the Protection of Forest Trees

(Established by the Forest Commission.)

1. All persons intending to light fires for the purposes of clearing or improvement must give notice of their intention to the nearest firewarden before such fire is lighted. They must also give notice to all owners or occupants of adjoining lands at least forty-eight hours before lighting such fires, which will be permitted only when the wind is favourable.

2. No fires of the character before mentioned will be permitted until the trees are in full leaf. After such fires are lighted competent persons must remain to guard them until the fire is completely extinguished.

3. Fires will be permitted for the purpose of cooking warmth and insect smudges, but before such fires are kindled, sufficient space around the spot where the fire is to be lighted must be cleared from all combustible material, and before the place is abandoned fires so lighted must be thoroughly quenched.

4. All fires other than those hereinbefore mentioned, are absolutely prohibited.

5 Hunters and smokers are cautioned against allowing fires to originate from the use of firearms, cigars and pipes, and all persons are warned that they will be held responsible for any damage or injury to the forest which may result from their carelessness or neglect.

6 Felling trees, and girdling or peeling bark from standing trees, are prohibited. Fallen timber only may be used for firewood and camp construction.

7 Foresters and firewardens are instructed and all citizens are requested to report to the forest commission immediately all cases of damage or injury to forest trees arising from a violation of these rules which may come to their knowledge.

Beneath these rules, and on the same placard are printed sections 10, 30 and 31 of the Forest Commission Act, and the following —

Section 74 (as amended by chapter 256, Laws of 1889)

Every person who shall trespass on any lands belonging to the people in this State or on any Indian lands or who shall trespass upon any other lands within the bounds of the forest preserve or which may hereafter be included in the forest preserve, by cutting or carrying away timber growing thereon, shall forfeit and pay the sum of twenty-five dollars for every tree that shall be cut or carried away by him or under his direction.

From the Penal Code.

414. A person who having been lawfully ordered to repair to the place of fire in the woods and assist in extinguishing it omits without lawful excuse, to comply with the order is guilty of a misdemeanor and shall forfeit the sum of fifty dollars and be liable to a fine and imprisonment.

640. *Malicious injury and destruction of property.* A person who wilfully cuts down, destroys or injures any wood or timber standing or growing or which has been cut down and is on lands of another or of the people of the State, or cuts down girdles, or otherwise injures a fruit, shade or ornamental tree standing on the lands of another or of the people of the State, is punishable by imprisonment not exceeding three months or a fine not exceeding two hundred and fifty dollars, or both.

REASONS FOR ESTABLISHING ADIRONDACK PARK.

The following account of the reasons which induced the people and Legislature of the State of New York to undertake the work of establishing a great Park among the Adirondack mountains, and of the means which have so far been adopted, is condensed from the reports of the New York Forest Commission for 1890 and 1891 —

In pursuance of a resolution of the Senate adopted January 20th, 1890, the committee on finance recommended the adoption of the following concurrent resolutions

Resolved, (if the Assembly concur) "That the forest commission be and hereby is directed to take into consideration the message of the Governor, addressed to the legislature, calling attention to the subject of establishing a State park in and about the headwaters of the rivers having their sources in the Adirondack wilderness, and after thoroughly investigating the possibilities of such an undertaking to report to the legislature its conclusion thereon and its recommendations as to the most effective methods to be employed to accomplish that end—either by bill or otherwise—together with any pertinent facts within the knowledge of the commission relating to the general subject of forest preservation or extension, and further to report the number of acres or square

[illegible] subjects referred to in said message of the Governor"

The [illegible] was passed by the Senate, March 5th, 1890, and by the Assembly, April 4th, 1890.

[illegible] report [illegible] extract. It has been said that the [illegible] and streams among [illegible] property in a reckless and wasteful manner without regard to the vested rights of others. It becomes the duty of the State to interfere and prevent a crime. Here by ruthless destruction of the forest the [illegible] country of a water supply which has been stored [illegible] the [illegible] interests [illegible] protection. The [illegible] State are very great and are already suffering from this waste. The water supply of the Canal [illegible] from the streams of this Watershed and the Erie Canal [illegible] to Albany. Several streams supplying the Mohawk [illegible] Utica and Rome [illegible] water power has lessened very much. The owners of these and other people feel that their water supply is failing, and the farming lands throughout the State suffer from drouths and [illegible] necessary moisture. It is of paramount importance that [illegible] the natural law governing rain and rivers must have their part [illegible] protect the interests which they feel but the cause of which they do not understand. The State must apply the remedy and so protect their interests preserve the forest. The great Adirondack forest as a powerful influence on the general [illegible] of the State upon the [illegible] water and temperature, [illegible] throughout the year the amount of moisture carried by the atmosphere, [illegible] in a measure control the power [illegible] and equalizing the temperature of the whole State."

The commissioners say, in concluding their report:—

"There is no need for any extensive [illegible] in the improvement of a few of the principal roads leading to the settlements. The forest is in fact a natural park and it would be improper to [illegible] and fencing it for it always has been common under the power of the State. The question before your Commission is one of great importance to the State and requires further consideration. But the present we [illegible] and recommend that the whole matter now owned and held by the State be retained until that question be decided."

[illegible] the resolution passed by the Legislature [illegible] forest commission [illegible] forest [illegible] by [illegible] report upon [illegible] to establish a park [illegible]

First—Is it [illegible] a State park in the Adirondack wilderness feasible?

Second—If it be, what shall be the area of the park?

Third—What lands shall be embraced within the park?

Fourth—How shall the lands that ought to be [illegible] within the park and not owned by the State, be acquired?

A survey of the [illegible] known as the Adirondacks [illegible] at [illegible] Taking the most [illegible] the [illegible] Adirondack wilderness [illegible] own now to be about [illegible] [illegible] the [illegible] of water, [illegible] [illegible] farms and [illegible] [illegible] This area [illegible] a compact tract [illegible] separated [illegible] by [illegible] quarter of

through the timber dealer and the lumberman

maple, beech, etc.) standing

to be marketable in about fifteen years.

preserved from fire, be reclaimed by the forest

found to exist upon them

4,000,000 acres

and which shall also be a sanitarium for invalids

THE ADIRONDACK PARK ACT

The Act which was passed by the State Legislature 20th May 1892 respecting the Adirondack Park is as follows —

do enact as follows —

timber supply

by the commissioners of the land office as hereinafter provided

commissioners of the land office

of the land office to be treated as part of their archives

as provided in section four

expenses of the forest commission

be granted to any such lessees

tection of the forest preserve shall be applicable to the Adirondack park except as in this act otherwise provided and the forest commission may enact the same prosecutions and institute and maintain the same proceedings which it is or shall be entitled to conduct institute or maintain with reference to any portion of the forest preserve and all acts forbidden upon the forest preserve are and shall be deemed forbidden within the Adirondack park except as herein otherwise provided, and all statutes of law upon the Adirondack park shall be subject to the same punishments and penalties as if such statutes were extended upon any part of the forest preserve.

(11) The foresters and other employees of the forest commission shall when so directed by the forest commission act as game and fish protectors and as such they shall have all powers within the Adirondack park which game and fish protectors now or shall have under chapter five hundred and seventy-seven of the laws of eighteen hundred and ninety-eight and any law hereafter to be enacted and they shall from time to time make such report to the commissioners of fisheries as that board may require. Nothing in this act contained shall be construed to permit any violation within the Adirondack park of the game and fish laws of the State heretofore or hereafter to be enacted or to restrict or alter as to such park any of the prohibitions or penalties prescribed or hereafter to be prescribed by such fish and game laws. It shall be the duty of the forest commission with the concurrence and approval of the commissioners of fisheries to provide for the enforcement within the Adirondack park of such fish and game laws by such means as the forest commission shall deem wise in addition to such other means as are or shall be provided by law.

(12) The forest commission shall include in its annual report an account of its proceedings with reference to the Adirondack park and shall make such recommendations with reference thereto as it shall deem wise. The forest commission shall state also in its annual report the number of acres purchased and sold during the year under the provisions of this act the locality of the same the price paid or received and all other information of importance connected with such transfers and shall state the amount of money required in the next fiscal year for the purchase of lands and for the expenses of the park.

(13) Chapter four hundred and seventy five of the laws of eighteen hundred and eighty seven and all acts and parts of acts inconsistent with this act are so far as they are so inconsistent, hereby repealed.

(14) This act shall take effect immediately.

PUBLIC UTILITY OF THE PARK

The Commissioners in their report for 1901 go on to say:—

"At this late day after all that has been written and said on the subject we do not propose to discuss the necessity of forest preservation and the acquirement of the Adirondack wilderness by the people. Throughout the entire State there is a demand for this which is constantly urged by the newspapers the local forestry associations and by a general widespread expression of public sentiment. Among all the demands and arguments in favour of the project a dissenting voice has not yet been heard. If there have been such they arose from questions of detail only.

The organization called for forest preservation with reference only to protecting the head waters of our rivers and providing a future economic and perpetual timber supply. But lately the acquisition of this forestry has been urgently demanded by the public for the purposes of a health and pleasure resort and the original movement has become largely subordinate to the latter one.

or wait until it is removed and then attempt to buy the land?

ment, furnish future revenues to the State

strongly urging the reservation of the Adirondack wilderness

home to persons of moderate means as well as to the wealthy

prehensive

magnitude of the interests involved

Catskill as well as in the Adirondacks and not without good reason

tions for people of moderate means

Still aside from all such reasons, the acquisition of forest lands in the [redacted] an important watershed

FOREST FIRES

Under this heading the Commissioners in their report for 1891 say —

[redacted] compared with the destructive conflagrations which [redacted] districts seven years ago, prior to the organization of [redacted] system. That the succeeding reports show a greater number of fires than last year is due to the fact that extra effort has been made this season to secure [redacted] chance of the forest commission in this respect. This correspondence was pushed [redacted] as originating in lumbering operations, or in the "slash" left by log choppers [redacted] were due to various and sometimes unknown causes.

[redacted] n cases where the fire was discovered as soon as started, and a posse of men [redacted] to watching it until the rain could accomplish the work. The [redacted] g regularity with which the larger fires were followed by rain was a [redacted] however far from perfect as yet, but each year has brought with it better methods and a more effective organization. The commission feels encouraged [redacted]

"In one case a serious fire was started by an incendiary. This occurred [redacted] this slash. The printed handbills containing the announcement of this reward were conspicuously posted and freely distributed throughout the

country, but the officers of the commission were unable to obtain any clue whatever to the perpetrator of the crime.

"Another incendiary fire was started in Franklin County, near Loon Lake, May 2nd, a full report of which, made by firewarden Chase, will be found on a subsequent page.

"The miscreants who start these fires have every opportunity for accomplishing their work without fear of detection. They enter the forest alone and unobserved, start a fire, and then, aided by their knowledge of the wilderness, emerge at some point many miles distant. These incendiary fires are the cowardly means resorted to in revenge for fancied wrongs, and it is an unpleasant fact to contemplate that in certain localities the forest is at the mercy of any lawless man, who brooding over imaginary grievances, or inflamed by ignorant passion or drink, seeks to gratify a revengeful spirit by this dire resort. One need not travel far in the Adirondacks before the ear will catch the discontented muttering and significant threats which leave no doubts as to the danger from this source.

"From the table given it appears that of eighty nine fires reported, the causes were —

From clearing land	22
From railroad locomotives	10
From railroad track bands	3
From hunters and fishermen	9
From mischievous boys	5
From incendiaries	4
From camp fires	3
From mosquito smudge	1
From tobacco smoking	3
From sparks from saw mill	1
From causes not stated	14
From causes unknown	14
Total	89"

SANITARY BENEFITS OF THE ADIRONDACKS.

The advantages of the Adirondack Park as a health resort are becoming recognized. On this point the Commissioners in their report for 1891 have the following —

"Information regarding the sanitary benefits of the great forest is so largely sought after that, at the risk of repetition, we quote from one of our previous reports.—

"The sanitary value of our forests cannot be over-estimated. In addition to their furnishing a summer resort for the over crowded population of our towns and cities, a place where rest, recuperation and vigour may be gained by our highly nervous and over worked people the healthful and purifying influence of coniferous forests has been thoroughly established.

"The testimony based on personal careful and scientific investigation of such men as Dr E. L. Trudeau, of Saranac, cannot be set aside. Himself an invalid restored to health by forest life, he has devoted himself to the question of environment, in its relation to tuberculosis, and by experiment on living animals, has demonstrated the value of the terebinthine forests of the Adirondack region as a factor in warding off pulmonary diseases. He says —

agent in lung affections. He writes –

excess of ozone in the atmosphere and turpentine exalation

one to take his weak lungs to an antiseptic air, but it is possible to render the homes evergreen trees."

THE CUTTING OF TIMBER FOR PULP WOOD

The conditions which obtain in the area covered by the Adirondack Park of the State of New York, in so far as the forest itself is concerned, are analogous to those in the wooded parts of Ontario, and the following extracts from the report [illegible] are interesting in view of what is going on in our own Province:—

[illegible] small-sized timber, the sale of which is necessary to an economic forestry management. The successful pecuniary results obtained in the management of [illegible] expense [illegible] available.

The pulp-mills on the eastern side of the Great Forest use timber whose [illegible] speedy extinction of the conifers [illegible] for the balance, but the proportion of poplar used is growing less. The mills on the Black River use spruce, balsam, poplar and some small second-growth pine. Hemlock is used to some extent, when mixed with other kinds of wood. In making chemical fibre, however, the sulphite mills can use one-third hemlock. Tamarac is also used in small quantities, but it is [illegible]

of the pulp taken out in Lewis and St Lawrence Counties is passed before it is taken from the forest thereby obviating the use of barking mills at the mills. The supply of pulp timber is cut during the late winter which lasts from March twentieth to August fifteenth, before or after which time the bark will not peel.

In estimates of a general character the cord of timber is said to make one ton of brown pulp, but the actual results indicate that a cord of wood will produce 1½ tons of pulp. In the chemical process the cords of wood are counted in making up the pulp, after the bark is removed.

Wood pulp or cellulose, which last name for this country was used for paper as early as 1854, but its extensive use dates from 1867. Since then the demand for paper stock has increased, and now a large proportion of the paper stock is made from wood. Other countries have also found that these new materials are profitable, each year. In the form of pulp it is used to a great extent in making the paper upon which our daily newspapers are printed. In this State large mills are now at Watertown and Lockport which manufacture wood pulp, but the most extensive manufacturing of pulp from the Adirondack forest. Wood pulp is also used to some extent in the manufacture of gun-powder.

Prof B E Fernow of the Forestry Bureau at Washington says in his last annual report: "Were the use of timber has been superseded in ship building the steel torpedo ram of the Austrian navy received a protective armour of cellulose, and our own new vessels are to be similarly protected. While this armour is to resist the effect of shots and projectiles by stopping up leaks on the other hand barrels for refined oil are made of wood pulp. Many products sugar, glucose, and alcohol can be derived from it, and numerous tanning extracts and dyes have been successfully manufactured from it. An extract is also obtained which is claimed to possess the property of rendering cotton fabrics fire and water proof for covering and finishing walls.

The State of New York leads all other States in the manufacture of wood pulp having seventy-three mills engaged in the industry out of the 267 mills in the United States. Wisconsin comes next with twenty-six mills, then comes Maine with twenty-four, and then New Hampshire and Vermont with thirteen each. Canada has a very large production of wood pulp, producing more than one-half as much as the whole of the United States.

Of the seventy-three mills in the State of New York, sixty-four draw their entire supply from the forest lands of Northern New York, or what is known as the Adirondack woods." (pp 221 222.)

SPONTANEOUS RENEWAL OF THE FOREST

Where the efforts of nature are not thwarted by the ravages of fire the tendency of the forest is to reassert itself. This is especially true at this particular time, the case where the primeval forests have been subjected systematically, as for instance in the operations of charcoal-burners.

After crossing the mile the coal runs for a few miles through a State land some of which was burned over about twenty-five years ago, and which is now covered with a new growth of young trees and saplings that if this land is protected

from further damage by fire it will in a short time completely restock itself" (p. 113)

[illegible] "Part of the forest [illegible] outlook for the future welfare of these forests." (p. 162).

[illegible] growth

[illegible] natural reforestation." (pp. 169 170)

[illegible] vigorous growth of spruce and balsam

"[illegible] cut." (p. 115)

already safe. The time is near when the propagation of this variety of pine must enter largely into our forest management.

"The tract of second growth white pine just referred to, lies along the road that runs from Minerva, through the Hoffman Township, within and near the south eastern boundary of the park. The land was once cleared and used for farming purposes but it was abandoned and it is now overgrown with a thrifty crop of conifers. Had these lands been denuded by fire instead of farming, the resulting crop of trees would have been of a different kind. Poplars and pin cherries would probably have appeared in that case. The fire burns into the ground, and destroys every hidden seed. Other seeds, distributed by well known agencies are subsequently deposited on its arid surface, of which the poplar and bird cherry are the only ones that will germinate in the then unfruitful soil." (pp. 197-8)

THE YELLOWSTONE NATIONAL PARK

The superintendent of the far-famed Yellowstone National Park in his report for the year 1890, makes the following remarks:—

[illegible] creation in 1872 of the Yellowstone National Park as a [illegible] monument of the people was a wise and timely act for a new question.

The Snake River Park of the Tetons and Green River Park of the [illegible] of California Peaks mates and nearly all other great [illegible] portion of the summit separating the Missouri and [illegible] and the Yellowstone Big Horn and other tributaries of the Missouri Missouri Arkansas waters the great extent remote from but [illegible] of the Yellowstone National Park and [illegible] Nebraska Wyoming Territory and also adjoining portions of Idaho and Montana. There can be no doubt that the [illegible] and Rocky Mountain barges and the most best of a stock summit sea.

It is also evident that at some [illegible] remote period of time many of these mountain chains were at an elevation of from 4,000 to 12,000 feet covered with dense forests of timber as we find it growing there upon the Pacific coast and that by some convulsion in the evolution of these mountains or [illegible] and some [illegible] which caused flames and [illegible] or other combustibles and [illegible] forests have been [illegible] several feet many thousand feet deep of ashes lava or other volcanic material.

[illegible] of the elements of the east of park and show [illegible] agatized [illegible] which is often petrified [illegible] a petrified tree or log of stone [illegible] which retaining [illegible] from the ax or the [illegible] which for cabinet specimens are unequaled [illegible] nature and [illegible] by art.

Many hot springs and mineral streams now pour forth [illegible] with sparkling [illegible] and [illegible] and many beautiful [illegible] [illegible] of [illegible] are [illegible] and many [illegible] of the [illegible] geyser period. The wonderful region is [illegible] the [illegible] park than a [illegible] [illegible] and [illegible] which extend [illegible] the [illegible] [illegible] mountain ranges. Its [illegible] [illegible] [illegible] Yellowstone Lake which is some 8000 feet or nearly a half mile higher than Mount Washington. Its [illegible] [illegible] [illegible] and [illegible] a [illegible] torrents. The [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] truly mystic land.

[illegible] of the region are the [illegible] or mountain buffalo, elk, white-tailed deer, black-tailed deer, prong-horned antelope, big horn sheep, bears, mountain lion or cougar, wolves, foxes, skunks, badger, raccoon, [illegible] rabbits, rats, mice, burrowing [illegible] squirrels, chipmunks, beaver, otter, mink, muskrat, etc., birds, fishes, reptiles, and insects.

Timber of the Park

"Black or bastard fir is far the largest variety of timber now growing in the park and usually found scattered through forests of smaller timber near the Mammoth Hot Springs, Tower Falls, Upper Yellowstone and other elevated terraces. It is often found from three to five feet in diameter and one hundred and fifty feet in height, and is not unlike the eastern hemlock in the irregular form of its branched top as well as the coarse grained, shaky, and inferior quality of its timber.

"Black spruce growing on the most sheltered slopes of the mountains near the snow-line, having a smaller trunk is fully as tall as the black fir and is a straighter tree and more valuable for timber or lumber.

"Red fir is the next in size (white nearly equal to that of the Norway pine of Michigan) and the first in value of any tree in the park for hewn timber for building bridges, etc., for which purpose it is admirably adapted. It is abundant in all except the very elevated regions.

White pine prevailing in symmetrical beauty, the white pine of the east, but much inferior in size, and somewhat in quality, is the prevailing timber of most of the elevated terrace groves and occasionally of the narrow valleys and canon passes of the mountains. It grows very densely often rendering traveling among it on horseback exceedingly difficult when standing and utterly impossible when burned and fallen, as it covers large areas of the park, proving one of the greatest impediments to exploring as well as to improvement by roads and bridle paths. It is the best material found in the park for lumber, shingles, small timber, rafters, fence poles, etc.

Balsam fir, somewhat different from that of the Alleghanies, is abundant and very beautiful singly or in dense groves or isolated clumps scattered over the grassy slopes, just below the mountain snow-fields.

"Cedar of a red or spotted variety, growing low, and very branched but with timber valuable for fence posts, is abundant.

Poplar or aspen is found in dense thickets among the sheltered foot-hills; dwarf maple with leaves often scarlet with fungus is sparingly found; and innumerable dense thickets of willow, the main value of all these last named varieties being for the food use of beaver or for bait."

Act of Dedication

The Act by which the Yellowstone Park was dedicated or set apart is as follows:

An act to set apart a certain tract of land lying near the head waters of the Yellowstone River as a public park.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, that the tract of land in the Territories of Montana and Wyoming lying near the head waters of the Yellowstone River, and described as follows, to wit: Commencing at the junction of Gardiner's River with the Yellowstone River and running east to the meridian passing ten miles to the eastward of the most eastern point of Yellowstone Lake; thence south along the said meridian to the parallel of latitude passing ten miles south of the most southern point of Yellowstone Lake; thence west along said parallel to the meridian passing fifteen miles west of the most western point of Madison

Lake thence north along said meridian to the latitude of the junction of the Yellowstone and Gardiner's Rivers thence east to the place of beginning is hereby reserved and withdrawn from settlement occupancy or sale under the laws of the United States, and dedicated and set apart as a public park or pleasure ground for the benefit and enjoyment of the people and all persons who shall locate settle upon, or occupy the same or any part thereof except as hereinafter provided shall be considered trespassers and removed therefrom

SEC. That said public park shall be under the exclusive control of the Secretary of the Interior whose duty it shall be as soon as practicable to make and publish such rules and regulations as he may deem necessary or proper for the care and management of the same. Said regulations shall provide for the preservation from injury or spoliation of all timber mineral deposits natural curiosities or wonders within said park and their retention in their natural condition.

The Secretary may, in his discretion grant leases for building purposes, for terms not exceeding ten years of small parcels of ground at such places in said park as shall require the erection of buildings for the accommodation of visitors all of the proceeds of said leases and all other revenues that may be derived from any source connected with said park to be expended under his direction in the management of the same and the construction of roads and bridle paths therein. He shall provide against the wanton destruction of the fish and game found within said park and against their capture or destruction for the purpose of merchandise or profit. He shall also cause all persons trespassing upon the same after the passage of this Act to be removed therefrom, and generally shall be authorized to take all such measures as shall be necessary or proper to fully carry out the objects and purposes of this Act

Approved, March 1st, 1872

NOTE. The boundaries of the park had not then been surveyed but they are natural crests of snow-capped basaltic mountains encircling the wonderland of cataracts canons fire-hole basins geysers sinters fumeroles, etc unique and matchless, with an entire area from fifty to seventy five miles square.

RULES AND REGULATIONS.

The rules and regulations governing the conduct of visitors to the Yellowstone Park and the care of same generally, are the following:—

1st All hunting fishing or trapping within the limits of the park except for purposes of recreation or to supply food for visitors or actual residents, is strictly prohibited and no sales of fish or game taken within the park shall be made outside of its boundaries.

2nd Persons residing within the park or visiting it for any purpose whatever are required under severe penalties to extinguish all fires which it may be necessary to make before leaving them. No fires must be made within the park except for necessary purposes.

3rd No timber must be cut in the park without a written permit from the superintendent.

4th Breaking the siliceous or calcareous borders or deposits surrounding or in the vicinity of the springs or geysers for any purpose and all removal carrying away, or sale of specimens found within the park, without the consent of the superintendent, is strictly prohibited

5th. No person will be permitted to reside permanently within the limits of the park without permission from the Department of the Interior, and any person now residing within the park will vacate the premises occupied by him within thirty days after he has been served with a written notice to that effect by the superintendent of said park, and notice to be served upon person or left at his place of residence.

NOTE. These rules and regulations are those adopted by Hon. Hoke Smith, Secretary of the Interior, at the dedication of the park.

Additional rules subsequently issued are:

(1) Cutting or permitting timber within the park is strictly forbidden by law. Any timber growing thereon, or other natural curiosities or wonders or the displacement of the same from their natural condition.

(2) Permission to use the necessary timber for purposes of fuel and for such temporary buildings as may be required for shelter and other uses, and for the cutting of such specimens of natural curiosities as can be permitted without injury to the natural features or beauty of the park, must be obtained from the superintendent, and must be exercised at such times and in such manner as he may prescribe and control.

(3) Permanent camps may be located when necessary, and shall be established at points designated by the superintendent. Those for the accommodation of visitors must not be established within the park where they have been located, or shall be vacated by the party requiring their use.

(4) Hunting, trapping and fishing, except for purposes of procuring food for visitors or actual residents, are prohibited by law; and no sales of game or fish taken inside the park shall be made for purposes of profit within its boundaries or elsewhere.

(5) No person will be permitted to reside permanently within the park without permission from the Department of the Interior, and any person residing there pursuant to such permission, or otherwise as provided in section 2475 of the Revised Statutes, who vacates the premises without having made such arrangements in writing with the Secretary of the Interior as may be satisfactory to him, will be notified by the superintendent of the park to remove from the premises, and will at his place of residence.

(6) *The sale of intoxicating liquors is strictly prohibited.*

(7) All persons trespassing within the limits of said park, or violating any of the foregoing rules, will be removed by the superintendent of the park, and if necessary such persons will be arrested by direction of the Secretary of the Interior, and dealt with as provided by law.

The Secretary of the Interior is hereby authorized to make and enforce such other rules and regulations as may be necessary and proper for the management and protection of the park, as required by the Statute, which expressly provides that the same shall be under the exclusive control of the Secretary of the Interior, whose duty it shall be to make and publish such rules and regulations as he may deem necessary or proper, and which regulations shall be binding upon all persons entering said park; and he may also make such contracts as may be necessary and proper to carry out the the objects and purposes of this Act."

Rental to the amounts of the respective tolls and rentals fixed above against the foregoing regulations will subject the parties offending to arrest and the penalties provided by law, upon the direction of the superintendent or his assistant in charge.

Approved,

S. J. KIRKWOOD,
Secretary.

P. W. NORRIS
Superintendent

AN ACT TO SET APART A CERTAIN TRACT OF LAND IN THE STATE OF CALIFORNIA AS A PUBLIC PARK

Whereas the rapid destruction of timber and ornamental trees in various parts of the United States some of which trees are the wonders of the world on account of their size and the limited number growing makes it a matter of importance that at least some of said forests should be preserved Therefore be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled that the tract of land in the State of California known and described as township number [illegible] north of range number [illegible] west and township [illegible] north range forty east and township [illegible] north range forty east and sections three and four of township two thirty three and forty four towns [illegible] north range forty east of Mount Diablo meridian is hereby reserved and withdrawn from settlement occupancy or sale under the laws of the United States and dedicated and set apart as a public park or pleasure ground for the benefit and enjoyment of the people and all persons who shall [illegible] or settle upon or occupy the same or any part thereof except as hereinafter provided shall be considered trespassers and removed therefrom

Section 2 That said park shall be under the exclusive control of the Secretary of the Interior whose duty it shall be as soon as practicable to make and publish such rules and regulations as he may deem necessary or proper for the care and management of the same Said regulations shall provide for the preservation from injury or spoliation of all timber mineral deposits natural curiosities or wonders within said park and their retention in their natural condition The Secretary may, in his discretion, grant leases for building purposes for terms not exceeding ten years of small parcels of ground not exceeding five acres in area at such places in said park as may be required for the accommodation of visitors all of the proceeds of said leases and other revenues that may be derived from any source connected with said park to be expended under his direction in the management of the same and the construction of roads and paths therein He shall provide against the wanton destruction of the game and animals within said park and against their capture or destruction for the purposes of merchandise or profit He shall also provide against trespassers upon the same and the driving of cattle to pasture therein and may in his discretion remove therefrom all cattle found within said park after the passage of this Act to be removed therefrom and generally shall be authorized to take all such measures as shall be necessary or proper to fully carry out the objects and purposes of this Act

Passed the House of Representatives August 21st 1890, approved September 25th 1890

ANCIENT FOREST LAWS

The evolution of law in its relation to forests game etc. from the earliest days to the present day presents an interesting [illegible] cannot be entered into here [illegible] have been evolved from Man Woods were [illegible] and have served from [illegible] which at various times have [illegible] and to retain the [illegible] as in forests which they have been [illegible] with the view of protecting a sufficient stock of what [illegible] necessity and which was never more so than now

In a law of King [illegible] that [illegible] the offender was to be mulcted three pounds

It was a law at [illegible] that [illegible] of his having [illegible] to be [illegible] In the [illegible] it appear [illegible] that [illegible] of danger

In Saxon times [illegible] the property [illegible] and warrens as [illegible] for any man to [illegible] be was [illegible] Date came to the [illegible] and [illegible] for the [illegible] Dane [illegible] extracts are translated —

(1) "Let there be then four men of the higher class who shall have the [illegible] *primarii forestæ* chiefs (or earls) of the forest

[illegible] custody as well of vert as of venison

[illegible] least [illegible] which the Dane [illegible]

(4) Again under each of these, let there be two of the lower class of men which the English call *tinemen* (or in modern phrase grooms) these shall take the night charge of vert and venison, and do the servile work

(5) If anyone of this lower class shall be a slave so soon as he is placed in our forest let him be free and we therefore discharge him from bondage

(6, 7, 8) Relate to outfit.

(9) Relates to exemption from all summons and popular pleas (*unless held by the* hundred courts) and from all summons to any other court except that of the forest

(10) Let the causes of the miskenning and all wrongdoers and the correction of them as well civil as criminal be judged and decided by the provident reason and wisdom of the first class but the enormities of the first class if any should happen (lest any crime should go unpunished) we will punish ourself in our royal anger

(25) Let no one cut any of our wood or underwood within the bounds of the defense of the forest which if anyone do he shall be amerced [costs] of an infringement of the royal chase.

(27) But if anyone shall cut down an oak or *ascent* or any tree that furnishes food for the beasts of the forest he is to infringement of the royal chase he shall pay to the king twenty shillings.

(30) I will that every freeman shall have venison or vert at pleasure on his open ground in passing on his own lands but without chase or the right of pursuing into the deer and at all times (venison or vert) wherever I think proper to have it

(31 to 34) concern [illegible] and mad dogs. The term forest law is to be understood as applying to large tracts of uncultivated land where deer used to be kept. As the deer in those forests and consequently the right of hunting them were deemed to belong to the Crown the forest themselves were brought under the same class of laws without reference to the deer and they remained the estate though the trees should fall the laws being executed by the crown with the right of forestage, and all the privilege of royal forests."

The laws of Canute were afterwards confirmed by divers succeeding kings though in practice they generally appear to have been little if anything more than the will of the Crown and were so much contested until the barons and others encamped at Runnymede from Monday the fifteenth to Friday the nineteenth of June 1215 during which time they were actively employed in roughly hewing the broad basis on which the bulwarks of our liberty are built, by forming the Magna Charta with King John

The Magna Charta of 9th Henry III, Chap 21 was the *Charta Forestæ* of February 10, 1225

Many liberties were then granted and customs admitted but the restraint on cutting of wood appears to have been considerably felt

The 13th of Edward the III Chap 1 and 2 gave commissioners powers for cutting and carrying wood but it was to be done with the view of the keepers of the forest

In the 17th and 20th of Henry VIII there are several acts respecting the forests, but they are principally modifications of former acts.

In the 35th of this reign was passed an Act for the preservation of wood but principally respecting coal and turf wood In Chap 17 an Act for the preservation of timber we find The king our sovereign lord perceiving and well knowing the great decay of timber and wood universally within the realm of England and that unless a speedy remedy in that behalf be provided there is a great and manifest likelihood of scarcity and lack as well for building houses and

t be felled when dead on the top

teen inches girt, and to be marked within six inches of the middle,

forests, etc , and confirms the 38th of Henry VIII

of the breadth of one foot at the stub and growing within fourteen years of the age of the latter statute Sessile Wye Hunter Ive Tame Iron Tree Trent or any other navigable River or Creek under pain of forfeiture of forty shillings for every tree the moiety to the Crown and the other to the informer recoverable as before

Second of Elizabeth Chap 15 is an Act for the preservation of timber in the wolds of Kent, Surrey and Sussex.

By the 43rd of Elizabeth Chap 7 it is enacted that if any two persons cut or spoil any wood or underwood or pollard trees standing and be convicted by two out of one or more witnesses if they cannot pay the satisfaction required they shall be whipped Recovery if worst do cut knowing it to be so to incur the same punishment.

The 21st of James I Chap 22 is an Act respecting bark as it relates to tanners curriers shoemakers and others concerned in leather By Sec 11 it is enacted that no person shall contract for oak bark to buy again By Sec 20 that no person shall fell or cause to be felled any oak tree meet to be barked where the bark is worth two shillings a cartload over and above the charges of barking and leaving timber to be employed in building and repairing houses and mills except but between the first day of April and the last day of June, upon pain of forfeiture of every such oak tree or double the value to the Crown And by Sec 21 for the better preservation of timber (which by the takers is spoiled through the loss of bark from the top and top or bark of timber trees) it is therefore enacted that no bark pullers or others their deputies shall fell for the use of the Crown any oak trees meet to be barked but in the barking season and for the purposes before mentioned or take or receive any profit gain reward or duty by any deputation or bark of any tree to be taken or cut out of the bark season and then only trees for the King's house or ships under pain of forfeiture to the party aggrieved or on whose ground such tree may be cut for every three pence forty shillings and it shall be lawful for every party of whom any tree shall be taken to retain as the bark to pay and cap of the wages of such tree notwithstanding any composition or other matter

The 15th of Charles II Chap 2 is an Act to revive the 43rd of Elizabeth more effective and enacts for more punishment on account that the destruction of wood tends to destroy the Commonwealth It is therein declared that the Justices of peace may appoint even on suspicion of having carried or in any way conveyed any branch or bundle of wood of any kind underwood pollard young trees bark or root of any tree gate stile post rail or hedge row wood broom or firs, etc

Chap 4 of the 16th of Charles II is an Act for the increase and preservation of timber in the Forest of Dean Between thirty and one hundred acres are directed to be enclosed Commissioners may sell decayed trees to make good and maintain the said enclosures When and how much shall be sold and by what authority as much shall be enclosed and how spared is declared Wood to be sold to be marked by the justices Cutting wood contrary to the Act shall subject a party offending to the penalties mentioned in former Acts The enclosed land to be as private property Reasonable waste out of it to any person whatever to burn and sell The King may retain game of deer but not above eight hundred

Provision for where tenants at sufferance and other offenders removed pay wages shall be recovered after Michaelmas 1667 and when and in what manner and privileges to be enjoyed Letters patent for certain woods and iron works saved Coal mines and grindstone quarries may be leased

The 9th and 10th of William III Chap 36 is an Act for the preservation of wood in the New Forest in the county of Southampton. Two hundred acres part of this forest to be enclosed for the growth of timber after being set out by commissioners two hundred acres more to be enclosed yearly for twenty years and to remain in possession of the Crown for ever. Wood is not to be cut without sufficient authority. No coppice wood to be cut. Fences not to be ploughed or sown. The foresters to be fined if they browse or lop any oak or beech tree in the forest. Charcoal not to be made within one thousand paces of the enclosure. Persons breaking down fences may be committed as rogues and vagabonds.

Ninth of Anne Chap 17 is for the preservation of white and other pine trees growing in Her Majesty's colonies of New Hampshire Massachusetts Bay and Province of Maine Rhode Island Providence plantation and the new Narragansett country or Kings province and Connecticut in New England New York and New Jersey. No person within the said colonies shall presume to cut or fell any white or any other sort of pine tree fit for masts not being the property of any private person such trees being the growth of twenty four inches and upwards at twelve inches from the ground without the royal license for so doing under the pain of forfeiting £100 for every such offence one moiety to the Crown and the other to the informer who may recover the same in any court of record. The surveyor general to mark the trees to be cut with the broad arrow but no other person than he or his deputy to make any mark under the penalty of £5.

In the 12th of Anne we find an Act Chap 9 for encouraging the importation of naval stores from America and Scotland for eleven years and thence to the end of the next session.

Sec 2d observes. Whereas there are in several parts of North Britain called Scotland pine and fir trees fit for masts and for making pitch tar resin and other naval stores but the land and wood which may yield such naval stores are mostly in parts mountainous and remote from navigable rivers therefore for the encouragement of the proprietor of such lands and woods in making roads and passages in rivers in those northern parts useful and commodious to the public as well as for conveying such naval stores to the seaports in North Britain to be brought by sea to England be it enacted that there be given a premium for every ton of hemp £6. of tar £4 of pitch £4 of resin £3 of masts £5 to be paid by the officers of the navy on a certificate from the custom house officer where the stores are landed."

The first year of George I presents us with an Act Chap 48 for the encouragement of planting and preserving woods. By it maliciously setting fire to wood is made felony.

Sec. 17 of Chap. 2, 5th of George I., directs particular examination into the quality of Scotch tar.

The 6th of George I Chap. 16 is another Act for the encouragement of planting and preserving wood. By it damage done to woods is made recoverable from the parish unless within a certain time it discovers and convicts the real offender.

Sec 3 of Chap 12 of the 8th of the same king directs that the inspecting officer shall grant no certificate unless the articles of which tar is particularly mentioned, are of good quality. In it many sorts of timber are enumerated as being imported from America, among them are wainscot pine etc and in consequence of these being imported from foreign countries at very advanced prices particularly in time of war it is enacted that the encouragement be given

to importation from the colonies. The law respecting the pine is nearly the same as enacted by Anne, but the penalty is reduced.

The 6th of George III Chap. 48 is an Act for the better preservation of timber and trees. It is enacted that every person not being the owner who shall cut or top cut or spud out or damage or otherwise destroy any kind of wood underwood poles stack of wood green stole or young trees or carry or convey away the same or shall have in their custody any such and shall not be able to give a satisfactory account how they came by them shall be convicted before a magistrate on the oath of one or more credible witnesses and be fined for the first offence any sum not exceeding £5 with a penalty for the second not exceeding £10 and for the third not to be deemed an inadvertency or negligence each person convicted shall not only forfeit the penalties and fines but shall be deemed guilty of felony and be transported for seven years. Oak beech chestnut walnut ash elm cedar fir asp lime sycamore and birch, to be considered as timber.

This Act was continued by Chap. 33 of the 14th of George III which further enacted that poplars alder larch maple and horsebeam should be deemed timber trees.

49th George III Chap. 72 was for the better preservation of wood in the forest of Dean similar to that of the 16th of Charles II Chap. 3 where 11,000 acres are directed to be kept enclosed in the forest and this Act encloses 6,000 acres to be kept enclosed in the new forest to be called nurseries for wood and timber. When the wood in such enclosures is past danger from the browsing of deer etc. they may be laid open and other quarters enclosed. Every person who shall unlawfully destroy or take away or break any timber shall forfeit for the first offence £10 for the second £20 but the third offence is felony and incurs a punishment of transportation beyond seas for seven years.

In 50 George III we have an Act to extend and amend that of the 48th and 49th of the present reign for the preservation of timber in the New Forest and to ascertain its boundaries and another Chap. 168 for ascertaining the forest of Dean in the County of Southampton. The waste and destruction had been of great value and utility from the timber and underwood thereon which of late years has been much increased and in many parts totally destroyed. In Sec. 68 it is enacted that no sheep goats etc. be kept for ten years in any of the enclosures of the forest of Dean unless the owners protect their neighbours fences from such sheep, etc.

In 52nd George III an Act was passed for making perpetual that of the 12th for lowering the duty on bark after it came to a certain price.

The 10th of Charles I Sec. 2, Chap. 23 referred to Ireland. By this it is enacted that for cutting pecking barking or otherwise destroying trees the offenders shall be punished and if they be poor and unable to pay the fine they shall be whipped. If the constable refuse to execute the order of the justice of the peace he shall be imprisoned till he agrees to do so.

14th William III Chap. 12 enacts among other things that every person having an estate of freehold of £40 a year and every tenant for years having a term of seven of those years unexpired and paying £10 a year shall plant or cause to be planted at convenable times every year and every year during the term of thirty one years ten plants of four years growth or more of oak beech ash walnut poplar elm or cedar in some ditch or elsewhere on the said lands and preserve them from destruction. Every person or society having any waste shall plant or cause to be planted in good authentic manner for the purpose five hundred trees of the aforesaid sorts upon their ground every and every year during such time or term as they shall keep or have the said waste works. Any person having 100 or more acres of land plantation measure or other tenants in common and over and above the ten trees within seven years

enclose with a good sufficient fence of stone wall [illegible] ditch [illegible] per acre [illegible] plantation acre thereof, and within [illegible] years afterward plant at the rate of [illegible] the length of [illegible] the ground when planted and [illegible] and at [illegible] for every ten [illegible] square [illegible] such acre in such [illegible] as they shall think fit, and keep the same enclosed and fenced from cattle for twenty years. No sheep or cattle [illegible] to graze in [illegible] for twenty years under the penalty of 20s. for every such sheep, one moiety to the informer, and the other to the poor of the parish.

Then followed several other Acts, the most important of which is 24 and 25 Geo. III, Chap. [illegible], being an Act to amend the laws for the encouragement of planting timber trees.

It is worth while to notice the great encouragement which the legislature of Scotland and England even in very ancient times [illegible] to the planting of trees. So far back as the year 14[illegible]7 by a statute of James II freeholders are [illegible] to cause their tenants to plant woods, trees and hedges. This [illegible] by the Act of James IV, 1503, chap. 74, by the Act of James V, [illegible], chap. 10, and by the Act of [illegible] James II [illegible], chap. 41 [illegible].

[illegible] of these enactments [illegible] and they are very curious in themselves and were passed [illegible] when [illegible] of woods [illegible] was [illegible].

(1) Statute, James II, 14th parliament, 6th March, 14[illegible]7. "Anent plantatioun of woodes and hedges and sawing of broome, the [illegible] that the king charge all his freeholders, both spiritual and temporal, that in the making of their Whitsunday [illegible] statute and ordaine that all their tenents plant woodes and trees and make hedges and saw broome after the [illegible] of their [illegible] in places convenient therefore, under sik paine as [illegible] of the barronne sall modifie."

(2) Statute, James IV, 6th parliament, 11th March, 1503, chap. 74, that [illegible] parkes [illegible] woddes and [illegible]. It is statute and ordained anent [illegible] in the [illegible] that [illegible] and [illegible] make them [illegible] have parkes with [illegible] stankes [illegible] hedges, and plant at the least [illegible] acre of wood [illegible] there is no greate woodes nor forestes."

(3) Statutes, James V, 4th parliament, 7th June, 1[illegible]

[illegible] for [illegible] of woddes, forrests and orchardes [illegible] for [illegible] within the realme in planting of woods, making of hedges, orchardes, yardes and sawing of broome. It is statute and ordained [illegible] the king's grace and his three Estates of Parliament that the Actes made [illegible] before by King James the First and [illegible] be [illegible] kept [illegible] penaltes [illegible]. [illegible] woddes and [illegible] within this realme [illegible] be [illegible] woddes and forestes [illegible] forest [illegible] make [illegible] and [illegible] extending to [illegible] acres of land [illegible] in places [illegible] convenient, and that they cause [illegible] that [illegible] for every [illegible] tree [illegible] the [illegible] after the [illegible] and quantity of their landes.

[illegible] trees [illegible] with [illegible] as now [illegible]. The [illegible] a period of the year [illegible].

The first [illegible] Act for [illegible] 1st James I, chap. [illegible] (A.D. 142[illegible]). In [illegible] that no man [illegible]

burning after the moneth of Marche quhir ane cornes be schorne, under the paine of fortie shillings, to be raised to the lord of the land of the burner, etc.

Subsequent Acts were 10 James III. Chap. 75, Anno. 1477, 4th James IV, Chap. 48; 6th James IV. Chap. 71; 6th James VI, Chap. 84.

There are a so several British statutes regulating the time for making muir-burn. The 6th George III proceeds thus: "And whereas the laws now in force in that part of Great Britain called Scotland for preventing muir-burn in forbidden time are found defective and insufficient, whereby not only the game, but *also many valuable woods and plantations have been destroyed*, for remedy whereof, be it enacted, by the authority aforesaid, that no person or persons shall make muir burn, or set fire to any heath or muir in that part of Great Britain called Scotland, from the last day of March to the first day of November in any year, under the penalty of 40s. lawful money of Great Britain, for the first offence," etc. This Act was amended by 13 George III, Chap. 54, sec. 8.

FOREST LANDS OF THE UNITED STATES

A bill to provide for the establishment protection and administration of public forest reservations and for other purposes was introduced in the Senate of the United States in June 1902. It is unnecessary to set out the bill here as it did not become a law but the report thereon which was submitted by Mr Pettigrew from the committee on Agriculture and Forestry contains matter of much value and interest as embodying an authoritative expression of opinion upon the question of the forest lands of the United States. It is given in full.

The Committee on Agriculture and Forestry having had under consideration the bill (S. [illegible]) to provide for the establishment protection and administration of public forest reservations and for other purposes report the following report:

(1) The United States forest reserves aggregate but [illegible] square miles of public lands which is designated to timber or wood land mostly situated on the slopes and crests of the western mountain ranges

Little regard to the character and location of the public lands has been given that it is impossible without much study to determine how much wood land is connected with them. An estimate was made in 1880 which placed the wood lands at 776,000,000 acres of which of course an unknown quantity has since been disposed of. There are still some wooded areas undisposed of in Minnesota Wisconsin Indiana a small amount in Michigan Louisiana Mississippi Arkansas and parts of Illinois but the vast forests are in the Rocky Mountain Pacific Coast and Sierra Mountain ranges mostly of coniferous growth (pines spruces firs, cedars, and redwoods) and mostly in subarid regions

The property is of present and potential value to the people of the United States in proportion as it is protected by such legislation as will secure to it the highest attainment for the purposes of use of the forest growth

The public lands are all held for the purpose of disposal to private holders hence no further administration or management of the same beyond that incident to their disposal has ever been attempted. In the case of timber lands however it was recognized to some extent at least that there was some additional value to them that needed consideration and special administrative measures. These measures have however been rather defensive against an otherwise threatened future loss of property by fraudulent methods and improvident conditions which cannot practically be enforced.

In California Washington and Oregon the law permits the purchase of [illegible] tracts not to exceed 160 acres for timber culture. The object of this law which was evidently to encourage the planting of timber areas in connection with agriculture seeds and young trees for cultivation and protection of the same has never been attained. It is alleged that in many cases of actual entry have been taken for timber culture without intention to fulfill the requirements of the entry and the land transferred to timber companies at four dollars per acre and immense tracts are being thus held for the same wasteful slaughtering operations that have exhausted the forests of the east.

In the Rocky Mountain States timber lands could not be sold but the citizen were entitled to free and remove timber on the public domain for mining and domestic purposes from mineral lands. In addition, railroad

companies are allowed to take timber for construction along their right of way. The impossibility of purchasing in a straightforward honest way from the Government either timber or timber-bearing lands—

has compelled the citizens of these nine States and Territories to become trespassers and criminals on account of taking the timber necessary to enable them to exist.

Settlements upon the public lands in these States and Territories under the homestead and preemption laws are usually a mere pretense for getting the timber. Compliance with these laws in good faith where settlements are made on land bearing timber of commercial value is well nigh impossible, as the lands in most cases possess little agricultural value and hence a compliance with the law requiring cultivation is impracticable. As to cutting timber from mineral lands, perhaps not 1 acre in 5,000 in the States and Territories named is mineral and perhaps not one in 5,000 of what may be mineral is known to be such.

By the provisions of the law approved March 3, 1891, the Secretary of the Interior is empowered to further regulate and restrict this cutting of timber for domestic and railroad use; but in the absence of officers to control and enforce these regulations and restrictions they are practically meaningless, especially since it is almost impossible to obtain convictions where all are equally violators by necessity arising from absence of adequate and equitable legislation.

And even if it were possible to enforce the regulations there could hardly be expected any method in the cutting performed by an unknown number of independent individuals, and such a system comes as near deserving the name of management as the plunging of a city by a band of soldiers in war time deserves the name of municipal administration. To verify the general existence of these conditions the reports of the Secretaries of the Interior, the Commissioners of the Land Office for the last fifteen or twenty years, and the report of a special commission laid down in a volume called "The Public Domain," published in 1884 (House Ex. Doc. No. 47), may be consulted, or information of the forestry division, Department of Agriculture, on the forest conditions of the Rocky Mountains.

(4) *In consequence of the absence of a well-developed system of administration the value of this forest property is annually decimated by fire and by illegal and wasteful cutting.*

It is not necessary to argue this point, for it is a necessary corollary of the preceding.

The Senate Irrigation Committee traveling two years ago in the western mountains was for weeks prevented from any view by dense clouds of smoke from forest fires, and it is asserted that in that year more timber was burned than has been used legitimately since the settlement of that country.*

* The acres burned over and values destroyed during the census year 1880 were reported as follows:

States and Territories.	Acres burned over	Value destroyed	States and Territories.	Acres burned over	Value destroyed
California	356,865	$440,750	Utah	42,865	$1,042,800
Washington	87,910	712,200	Colorado	112,800	[illegible]
Oregon	132,320	593,850	Arizona	[illegible]	[illegible]
			New Mexico	64,034	142,075
Total Pacific slope	527,045	$1,747,800	Total Rocky Mountains	423,464	$[illegible]
Montana	88,020	$1,128,000			
Idaho	2[illegible]	$[illegible]	Grand total	959,509	$[illegible]
Wyoming	83,780	3,265,000			
Nevada	8,710	19,000			

The worst damage of these fires is not so much to be sought in the destruction of the standing timber but in the destruction of the forest floor by which the chance for germinating of seeds and natural reforestation is annihilated, and the water regulating capacity of the forest is destroyed.

As to the amount of depredations, the following table, prepared from reports of the Land Office, is instructive, not only in showing the enormous amounts thus lost to the public treasury, compared with which the cost of a well-organized administration would be a mere bagatelle, but also by corroborating the statement that the loss is rarely recovered in the courts.

It should also be borne in mind that the cases reported do not by any means cover all cases of trespass, presumably only a small part, since the number of agents to ferret out the cases are ridiculously out of proportion to the area to be covered.

DEPREDATIONS ON THE PUBLIC TIMBER DURING ELEVEN YEARS.

Year.	Estimated value of timber reported stolen.		Amounts actually recovered, partly by compromise.	Appropriations for protection service.	Agents employed (number calculated on the basis of twelve months each per annum).
	Market.	Stumpage.			
	$	$	$	$	
1881	891,888	225,472	41,680	40,000	17
1882	2,044,272	511,069	77 365	40.000	31
1883	8,144,659	1,709,824	27 741	75.000	25
1884	7,289,854	1,093,178	52,108	75.000	26
1885	2,862,530	429,255	49.451	75,000	23
1886	9,339.679	1,726,516	101,086	75.000	21
1887	6,146,935	1,188,320	128,642	75.000	26
1888	8,397,500	840,146	128,522	75,000	25
1889	9,603,534	1,182,987	185,002	75,000	23
1890	5,067 153	832,420	100,942	75.000	29
1891	2,347,478	349,441	116,704	100,000	33
Total	54,135.481	10,093,627	1,009,243	780,000	*25

(4 It is a well know fact, demonstrated by European experience and practice. that by a proper system of cutting not only can a forest be reproduced without the necessity of expensive replanting and kept continuously productive, but its yield per acre and year, in quantity and quality, can by proper management be increased considerably beyond that of the virgin forest left without management.

The methods of management for natural reforestation, or "regeneration methods," are practiced, especially in France and Germany in broad leaved as well as coniferous forests. The cutting of the old timber is done with a view of giving chance for seeds of the desirable species to sprout and for the young growth to develop satisfactorily. These methods prevail especially in the mountain regions, where planting would be expensive and sometimes impracticable.

Since in the well-managed forests only such species as are valuable are allowed to grow to the exclusion of the inferior kinds, which the forester treats as weeds, the composition of the forest is improved the growth is kept at the

*Average.

not only in quantity but also in quality, is increased

to from 30 to at most 50 per cent, of the total crop of wood.

beyond any average computation.

congress at Nashville, Tenn., in 1892, says -

range of possibilities.

10,000 feet board measure

per cent. for new timber

of population, which may in part be explained by higher prices.

duction of our present forest area

spite of the originally greater reproductive power, expect no such annual crop

a common-sense management and more

increasing productiveness

soil conditions

cover

moisture, and the balance between the consumption and the saving of evaporation by forest growth is largely in favor of this kind of vegetation as compared with any other vegetable cover or with naked ground, provided the forest floor of decayed leaves, twigs, etc., is not destroyed. Furthermore the melting of snows is retarded under the forest cover, and [illegible] the humus retention of the surface water flow promotes subterranean drainage, insuring to springs a greater supply for a longer time.

This observation [illegible] popular writers [illegible] the forest floor being able to take up water and then [illegible] forest floor [illegible] sponge [illegible] after the supply has ceased. [illegible] was an unfortunate one.

The open runs, i. e., brooks, rivulets and rivers, receive their supply mainly from springs, but also from the surface waters which flow without [illegible] down the slopes. The more [illegible] derived from springs the more even is the water flow of the river; the greater the supply [illegible] surface drainage the more dependent is the water flow on the [illegible] rains and on the melting of the snows and the more changeable is the water flow. While, then, in the first place, the water flow in rivers is dependent upon the amount and frequency of rains and snows, the manner and time in which the water reaches the channels determines the greater or smaller extremes of water stages.

The retardation [illegible] the melting of the snow, which in a [illegible] mountain district may [illegible] for two or three weeks under a forest cover, is of great significance [illegible] the spring floods. The main influence, however, lies [illegible] the forest floor [illegible] surface drainage [illegible] to be in the ratio of 5 to 3.

There will be [illegible] extreme cases with excessive rainfalls or sudden rise of temperature in early spring [illegible] even a forest cover may have no practical effect in preventing a flood [illegible] accepted as a generally true proposition that a forest cover has a tendency to lengthen the time [illegible] and to reduce [illegible] flood conditions [illegible] the water flow more even [illegible] low and high stages.

Lastly, but of greater [illegible] the forest cover prevents erosion of the soil and [illegible] gravels [illegible] rivers [illegible] France [illegible] Along the coast and [illegible] the action of the winds, and in the mountains [illegible] avalanches [illegible] Switzerland [illegible] a forest cover [illegible] If there were any [illegible] regarding the influence of forest cover upon water and [illegible] forestation work undertaken by the [illegible] Department of France.

There [illegible] the washing [illegible] action of the rivers [illegible] floods [illegible] the mountains, when the government [illegible] of reclothing [illegible] slopes with tree growth and [illegible]

[illegible] torrents

[illegible] reservat on of all the timber lands in their State

To his Excellency the President of the United States

[illegible] State

for 1891 :—

WATER MANAGEMENT THE PROBLEM OF THE FUTURE

ground [illegible]. A large amount of what would be carried off by underground drainage is thus [illegible] surface drainage waters. At the same time [illegible] [illegible] thus increasing dangers of high floods and [illegible] favorable [illegible].

Here [illegible] water management and [illegible] forest management [illegible] [illegible].

(7) *Experience in the United States has shown that under private ownership forest conditions are almost invariably destroyed or deteriorated, for the simple reason that the timber at present is the only interest which private enterprise considers in the forests, not being concerned with [illegible] or the consequences [illegible].*

It is therefore undesirable to transfer the ownership of the public timber lands to private owners in the expectation of having them managed with a view to the broader interests of the community.

If there were needed other demonstration of this point beyond the history of the eastern forest lands, which have been for many years in the hands of private owners, we need only refer back to the working of the law in the Pacific Coast States, where such transfer to private owners has utterly failed in accomplishing its object. There is neither the interest nor even the knowledge to be found among the many to anticipate forest management by small owners, because forestry thrives best on large consolidated areas, from financial as well as technical considerations.

It will be necessary, in order to promote rational forest management, to do the same that all other nations have found necessary to do, namely, for the government to set the example and furnish the object lesson and opportunity for the others to follow.

The fact that a tree crop takes from fifty to one hundred or more years and more to grow to usefulness requires a patience and stability of ownership which our people have not yet attained, and hence the government must furnish the conservative elements where needed, as in our forest policy.

(8) *The cession of the public timber domain to the individual States with a view of having the States institute methods of conservative management would fail in accomplishing the object for various reasons. Experience in the past with such cessions has not proved it practicable to prescribe conditions [illegible] upon such cessions or to enforce them.*

Even if a cession, upon condition that the State provide efficient management, could be practically effected, lack of unity in the various systems and clashing of interests where watersheds are situated in more than one State, make retention of these lands in the general government desirable, or at least more promising of conservative results.

Other reasons of expediency make such a wholesale cession of timber lands impracticable. Among these may be mentioned the difficulty of segregating the timber lands from public lands of other description, or transferring obligations of the general government toward railroad companies resting upon such lands.

Nevertheless, cooperation with the State authorities in maintaining a sound forest policy is most desirable and should be made a prominent feature in whatever measures the general government may devise.

(9) *The present [illegible] the [illegible] of the public timber lands in the general government and [illegible] of the [illegible].*

(b) *That only a fully developed and separate system of management and of accounts carried on by competent men under expert advice can accomplish the objects of a rational forest policy*

(c) *That the duty of the public forest commissioners is twofold, namely to maintain the forest in a condition which experience has shown to be the most favourable to furnish material to the communities in their neighbourhood*

(d) *That where the surplus of products of materials would warrant an annual cut, and that funds for such cutting cannot nevertheless pay for itself by the sale of surplus forest material.*

It is only necessary to add a few words of explanation on this latter point with the object of the forestry division in favouring the practicability of a government forest administration:—

To meet any objections on the score of expense, a rough estimate of this question may be made as follows:

[illegible] I find that a thoroughly efficient administration [illegible] Ontario [illegible] It would be satisfactory if [illegible] that expenses be covered by the revenue. Where the annual growth of wood per acre on the reserved area would exceed in value the annual cost of administration the local interest and revenue [illegible] But when we consider that the present annual capacity of the region [illegible] and that 5 (6a) 88 will [illegible] per cent. of the net revenue [illegible] of these amounts are [illegible] from the gross revenue and the average charge for stumpage is taken at 10 cents.

And in another place (see Annual Report, 1886):—

[illegible] The cost of the fire service depends [illegible] the number of districts to be formed. Take Ontario as the whole we [illegible] contains about 5 [illegible] acres of pulpwood [illegible] We may require [illegible] rangers, 4 [illegible] inspectors, and an [illegible] in round figures at $[illegible]. The amount could be saved by [illegible] the head of the forest area, which seems to destroy over $[illegible] worth of pulpwood property, that would pay and the [illegible] feet or so of timber which may be cut annually the needs of the country for its development would certainly without hardship to any one, be enough to keep [illegible] the expenses of [illegible] and of the central service. The expenses of the latter with the necessary staff of clerks etc. would certainly be kept within the sum of $[illegible]. Even if the whole forest area were at that early epoch of its development [illegible] the expense of the service would not be more than 40 per cent. of the revenue which might be set down from this source, a loss which would be saved by preventing one half of the fires that yearly destroy about an equal amount.

Referring to the operations of several European forest administrations we find that their expenditures represent from 37 to [illegible] per cent. of their gross income, or from $[illegible] to $[illegible] per acre the net revenue being 63 cents to $4.60 per acre. These are results under conditions of very extensive management and under highest economic development. Taking Prussia alone with a population of [illegible] acres of forest and most poor and unfavourable conditions the cut is [illegible] amounted to [illegible] cubic feet of wood of which 21[illegible] feet went into coal wood and [illegible] feet in sawlogs or round to cubic feet of wood representing the annual growth per acre per year over the entire [illegible] acres with a proportion of 4.6 per cent in saw timber and wood for manufactures. The price received for this material in the woods [illegible] cut was at the average rate of $[illegible] per M feet board measure and $[illegible] per cord of both together about 5 cents per cubic foot of wood the total income from wood being $[illegible] of which 62 per cent came from saw timber. Other revenues of the [illegible] administration amounted to $[illegible] or a total $2.[illegible] per acre as against $10,888,893 in 1870

The expenditures, amounting to $8,716,740 or if special appropriations not recurring are deducted, to $8,582,268 represented 47.38 per cent of the gross income. It may be of interest to indicate in what direction this large amount is expended:—

There are 122 officers in higher branches of administration, aggregating salaries to the amount of	$154,350
681 district officers or managers	588,276
3,753 underforesters or guards	1,162,867
114 financial agents	73,141
Other temporary employes and personal expenses	1,073,587
Total personalia	$3,052,221
Cost of harvesting wood crop (lumbering at a little less than 7 cents per cubic foot)	$2,266,030
Buildings	599,824
Roads and water ways	410,102
Surveys	110,226
Injurious insects	60,454
Culture	1,230,882
Sundries	280,073
Total salaries and administration	$8,009,822
Forestry schools and scientific research	* 48,190
Purchase of lands	304,156
Sundries	434,632
Grand total	$8,796,740

Or $1.33 per acre, leaving a net revenue of $1.30 per acre, as against 97 cents in 1870, when the expenditure per acre was 34 per cent. less.

(10) The proposed legislation contemplates a segregation of the timber lands that are stocking on non agricultural soil from the other public lands and the transfer of their administration from the Department of the Interior where lands are held only for disposal to the Department of Agriculture, which is designed to look after cultural matters and where a bureau in charge of forestry matters already exists.

To save expense in the beginning and to create as quickly as possible an efficient protective service the army may well be employed for such duty. This service has been conferred upon the army in the Yellowstone and the California parks to the full satisfaction of both officers and men with the anticipated results as far as the protection of the forest property is concerned.

Co-operation with State authorities, such as forest commissions or commissioners, is provided for with a view of enlisting the authorities of the States in the upholding of a rational forest policy.

Since these forest reservations are not to be in the nature of parks, they are to remain open to public use and entrance for all purposes, excepting so far as restrictions appear necessary in order to protect the property from damage and depredation. Prospecting and mining are to be permitted under proper regulations.

The main features of the legislation, however, are its provisions for the cutting of timber under a system of licenses and the creation of the necessary force of officers to attend to the business of a regular forest administration pro-

* We use United States appropriate for a similar purpose, namely the forestry division in the Department of Agriculture, whose function it is to bring up an interest in the subject and to supply information on forestry matters where none existed before, less than one half of this amount.

perly The attempts hitherto of regulating the cutting of timber have remained futile for the lack of an organized system, and of the necessary force to maintain a system.

The license system here provided recognizes the various demands of settlers, prospectors, miners, and lumbermen as legitimate and necessary to be provided for differently according to the nature of their business and in an equitable manner

When all needs of the population can be legitimately satisfied with a sufficient force of officers to attend to the wants of the public in a business like manner there is no reason why the existing vandalism with which the public timber domain has been wasted should not cease destructive fires be reduced to a minimum a system of proper forest conservancy gradually be developed, and the American nation add to its civilization by a rational treatment of the forests of the public domain at least.

In connection the fact is recalled that as long ago as 1879 the writer of this report took occasion to refer to this subject before the Senate in the following language (see Congressional Record February 10, 1879

> There is another subject Mr President, not strictly agricultural and yet so closely allied to that interest as to demand consideration always when agricultural questions are under discussion I refer to the preservation of our forest woods from denudation Those who have investigated and given much thought to the matter declare that the wholesale destruction of the forests of a country without providing for a new growth not only seriously affects the material interests but impairs the health and comfort of all the inhabitants thereof Bitter experience long ago taught the people of the Old World that they could not with safety wage interminate war against their trees Nature is, in fact a kind mother to those who exercise an intelligent regard for her habits and her laws, but she is at times terrible in her wrath against those who blindly defy her decrees The ruinous waste of the forests of a country rudely disturbs that harmony between natural forces which must be maintained if the earth is to be kept habitable for its teeming millions
>
> We have ourselves heretofore sadly neglected these considerations, but our government cannot and must not much longer refuse to give to them its most serious attention If we may not with propriety restrain the recklessness from burning its own property, we can and should at least furnish information and devise plans through judicious legislation, which shall enable us to cooperate with the people to protect their common interests Most European governments have elaborated methods whereby they exercise a supervisory control over the forests of their dominions, and one day the public welfare will demand that our government shall follow their example The subject is a practical one it is not a dream of the theorist it concerns the pockets of the people and their welfare in many ways.

Considering the very great importance of this measure early passage of the bill is recommended.

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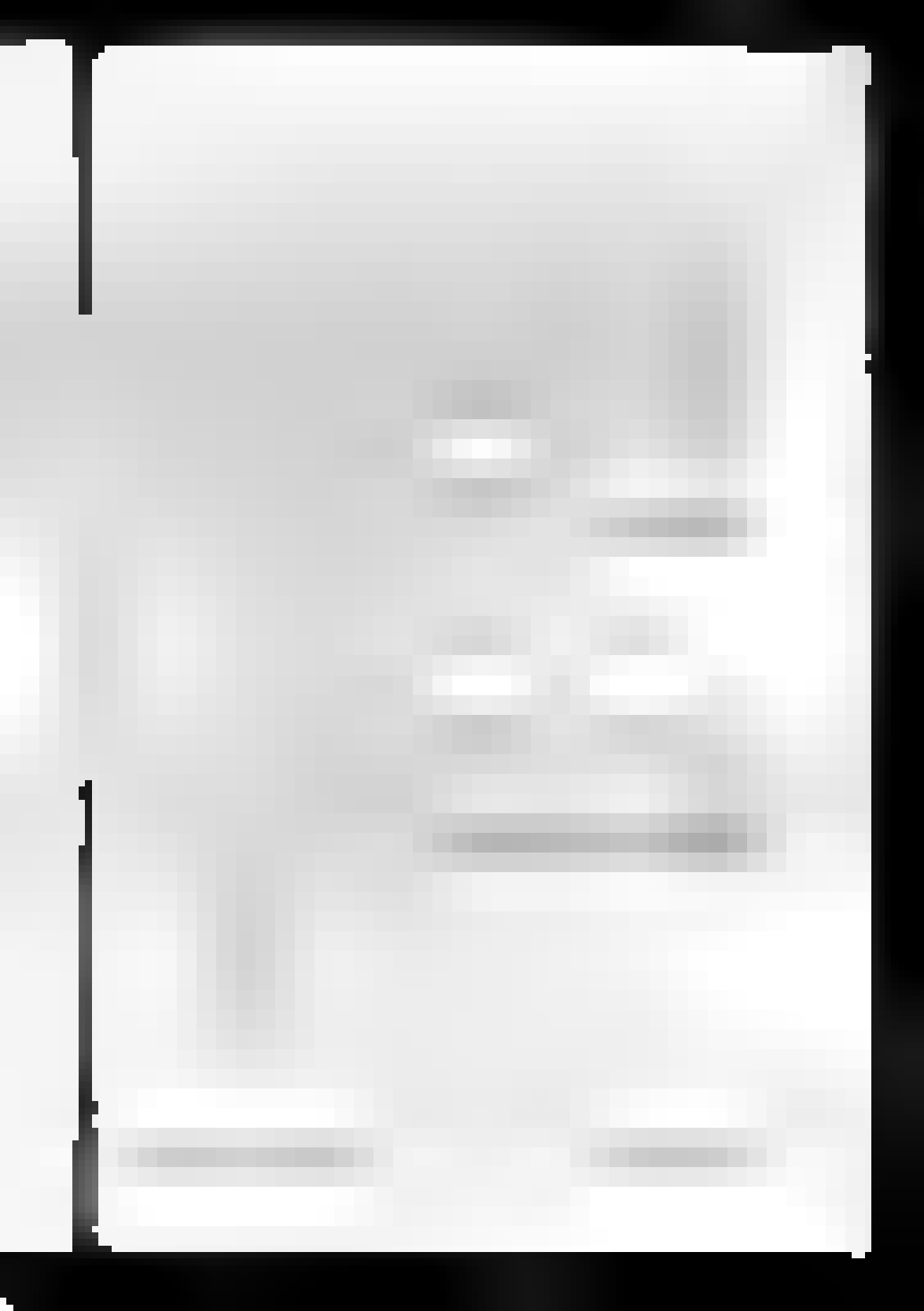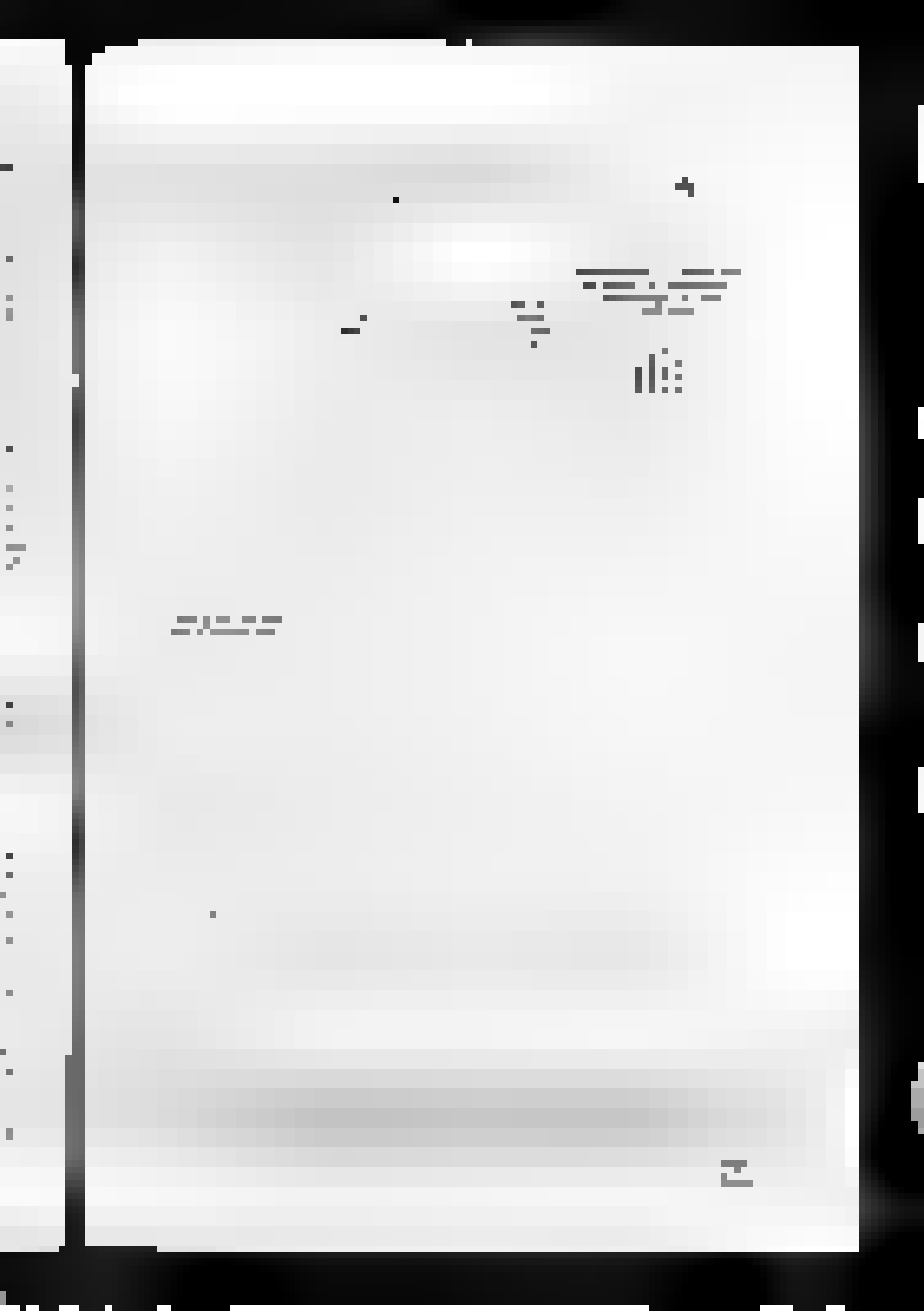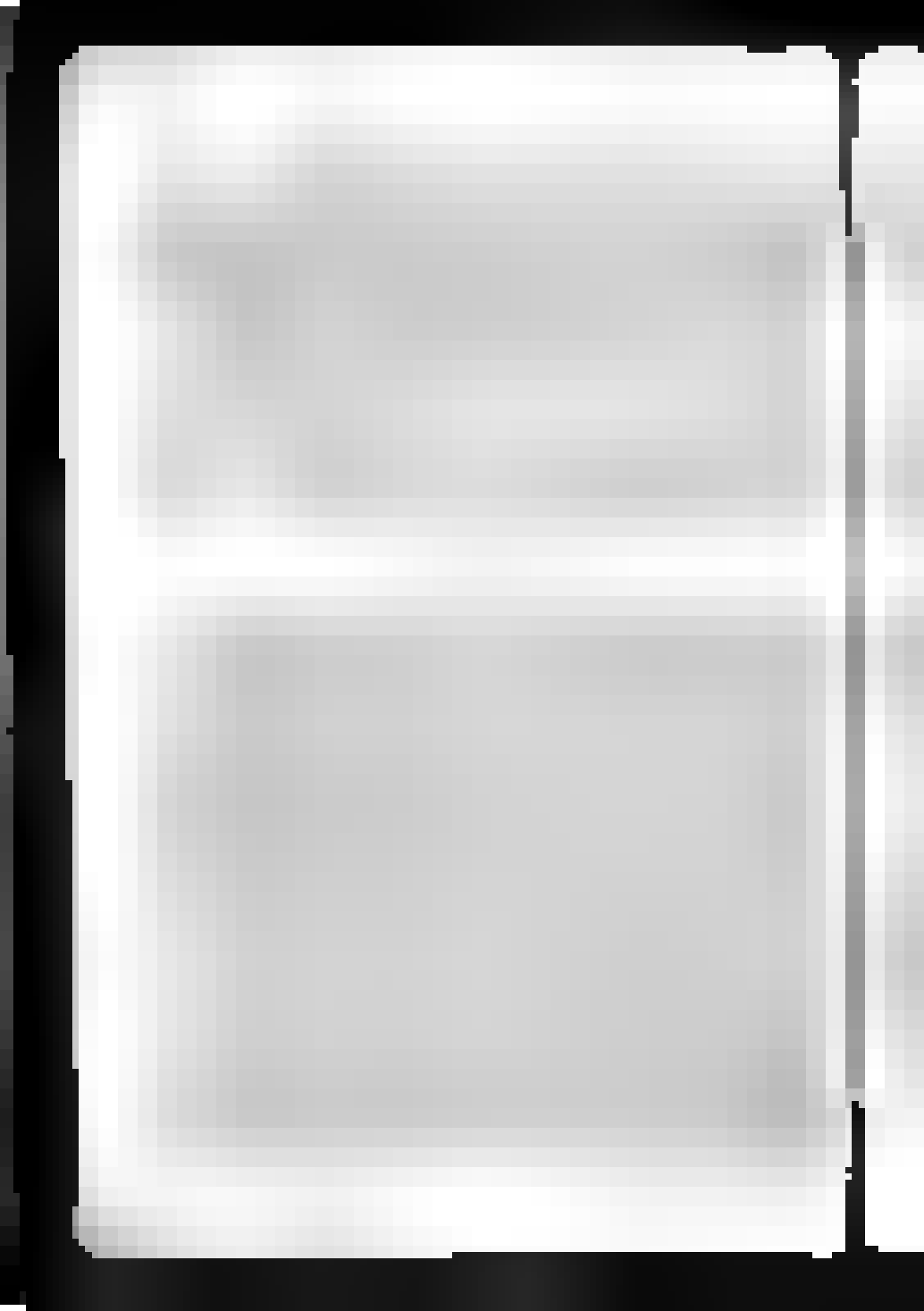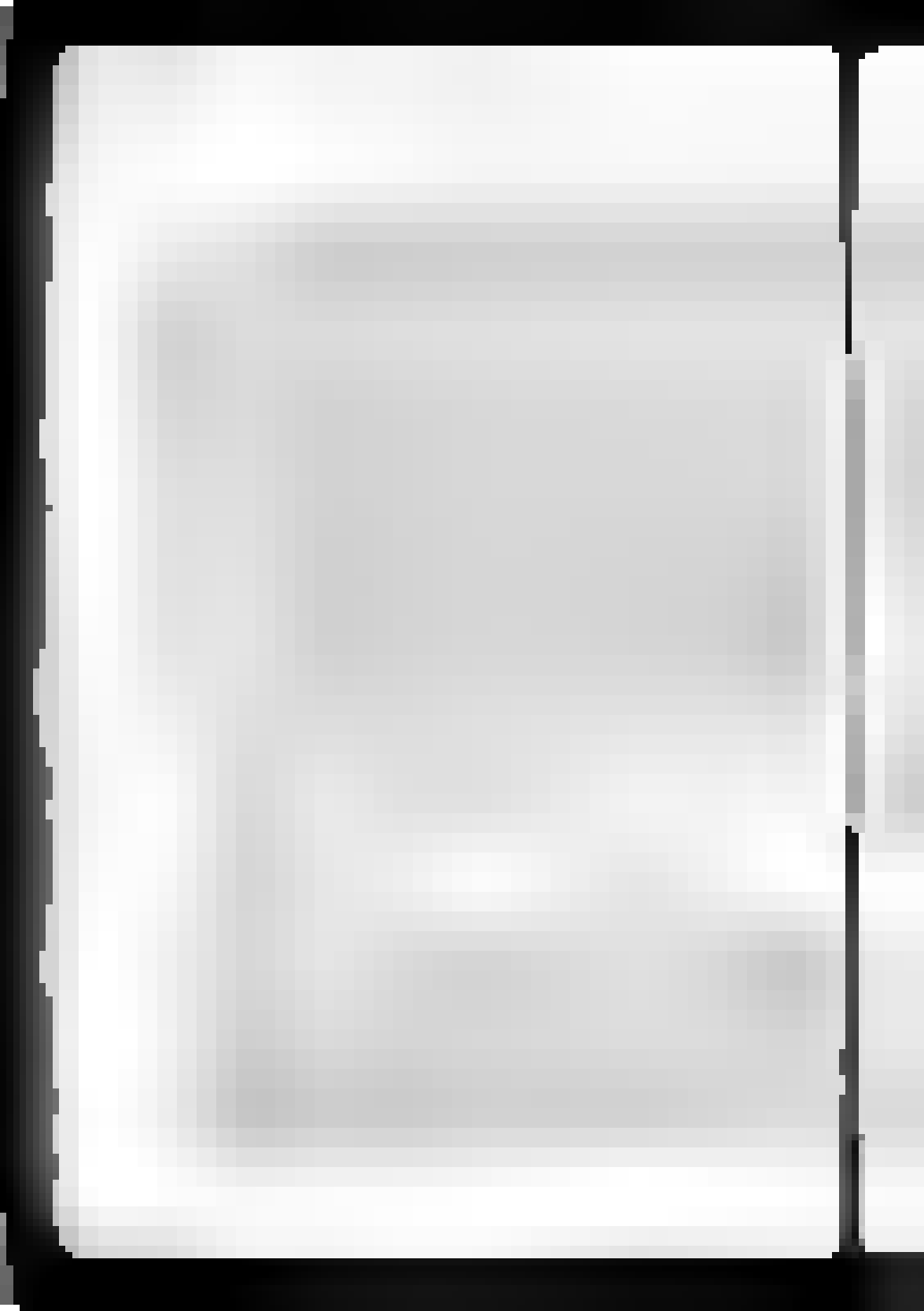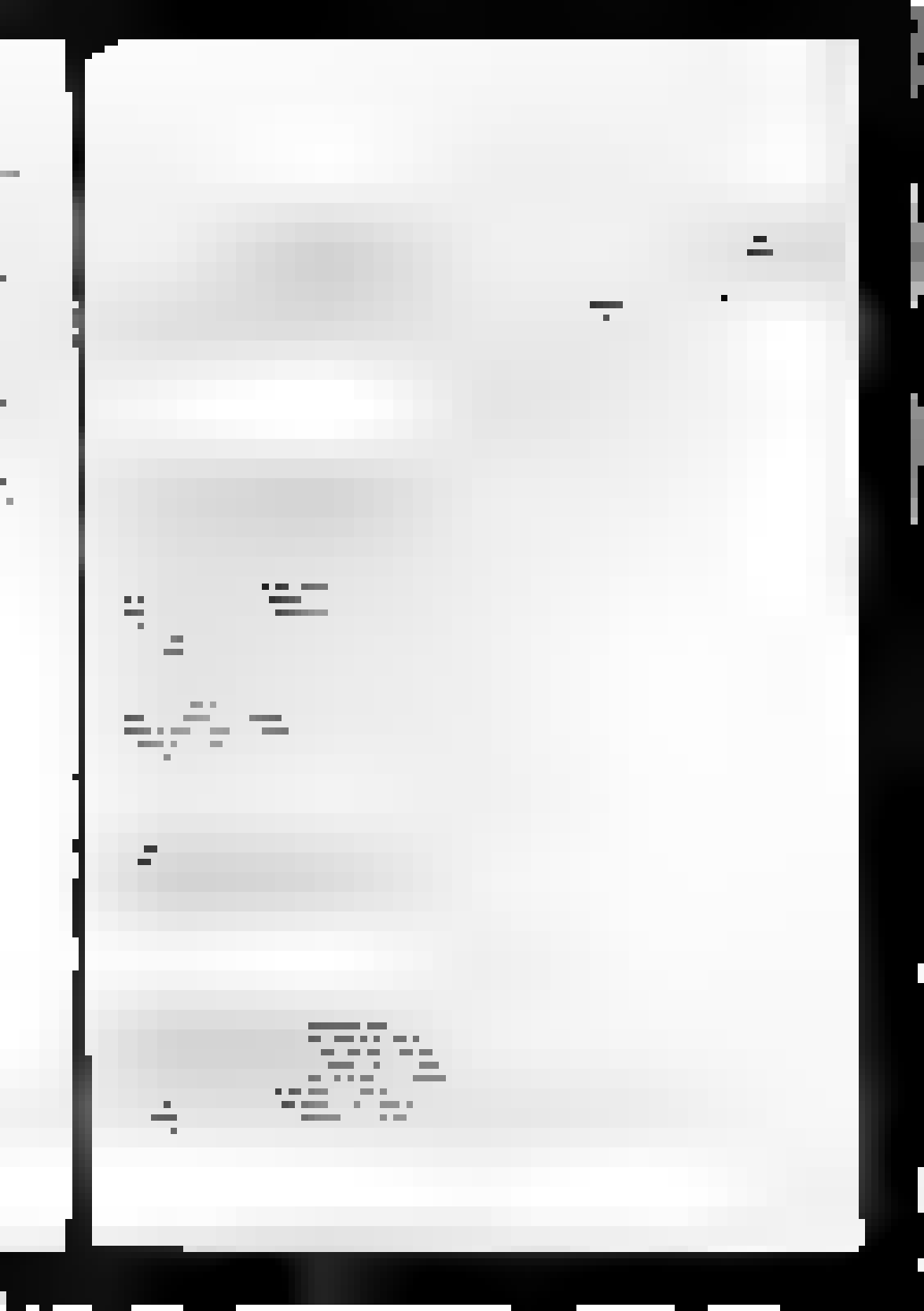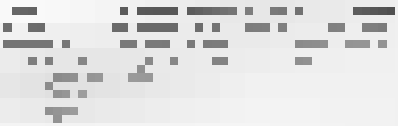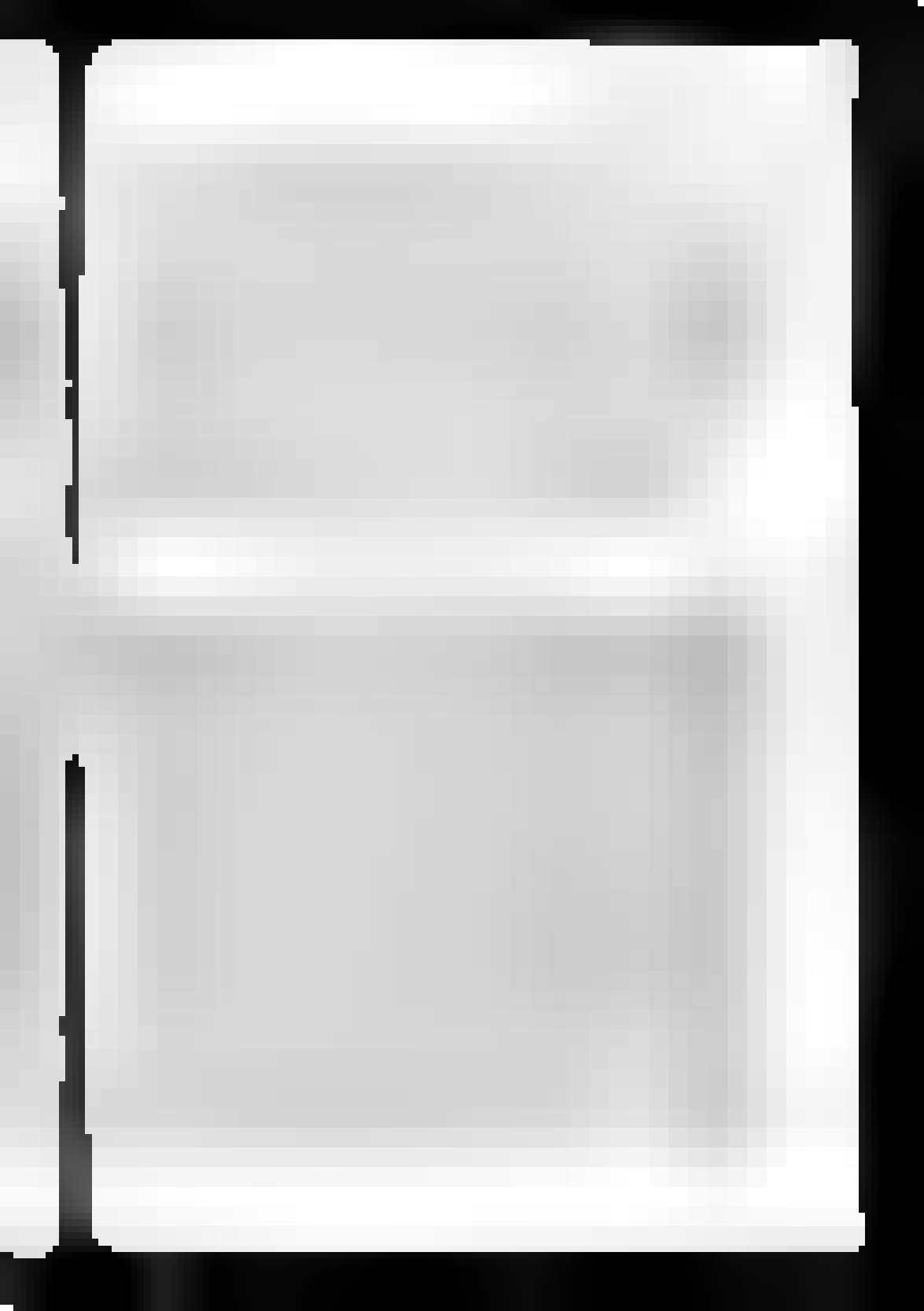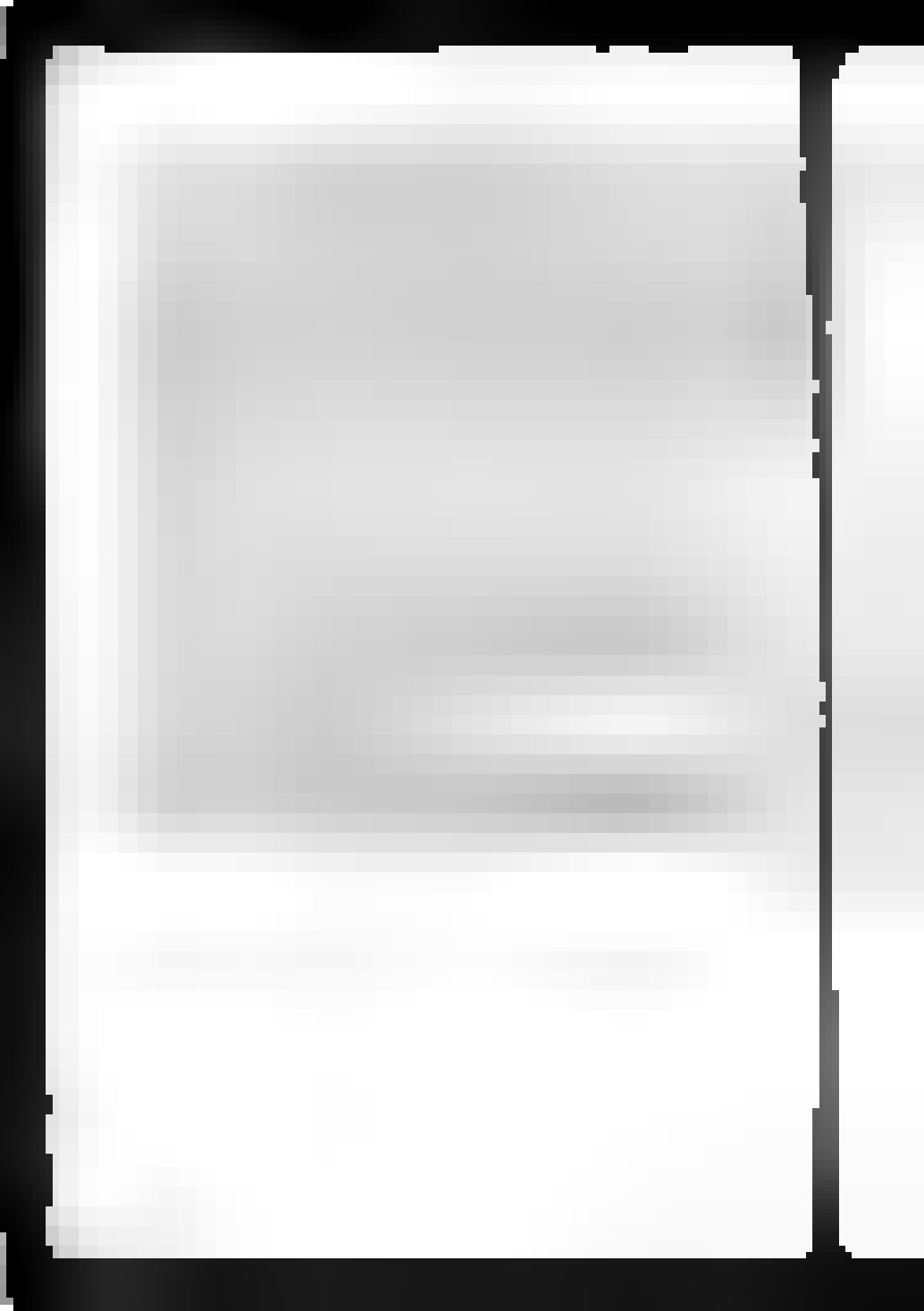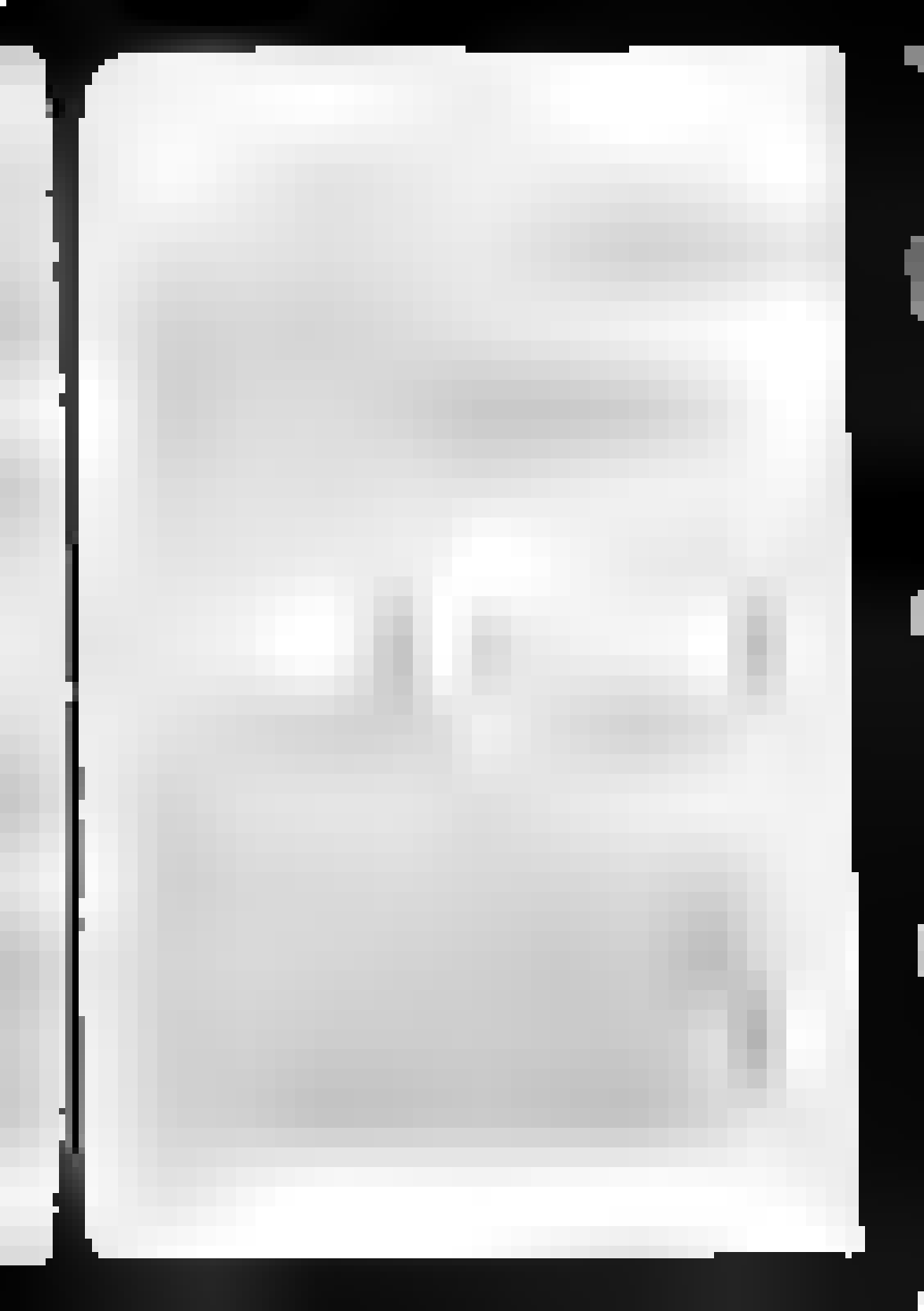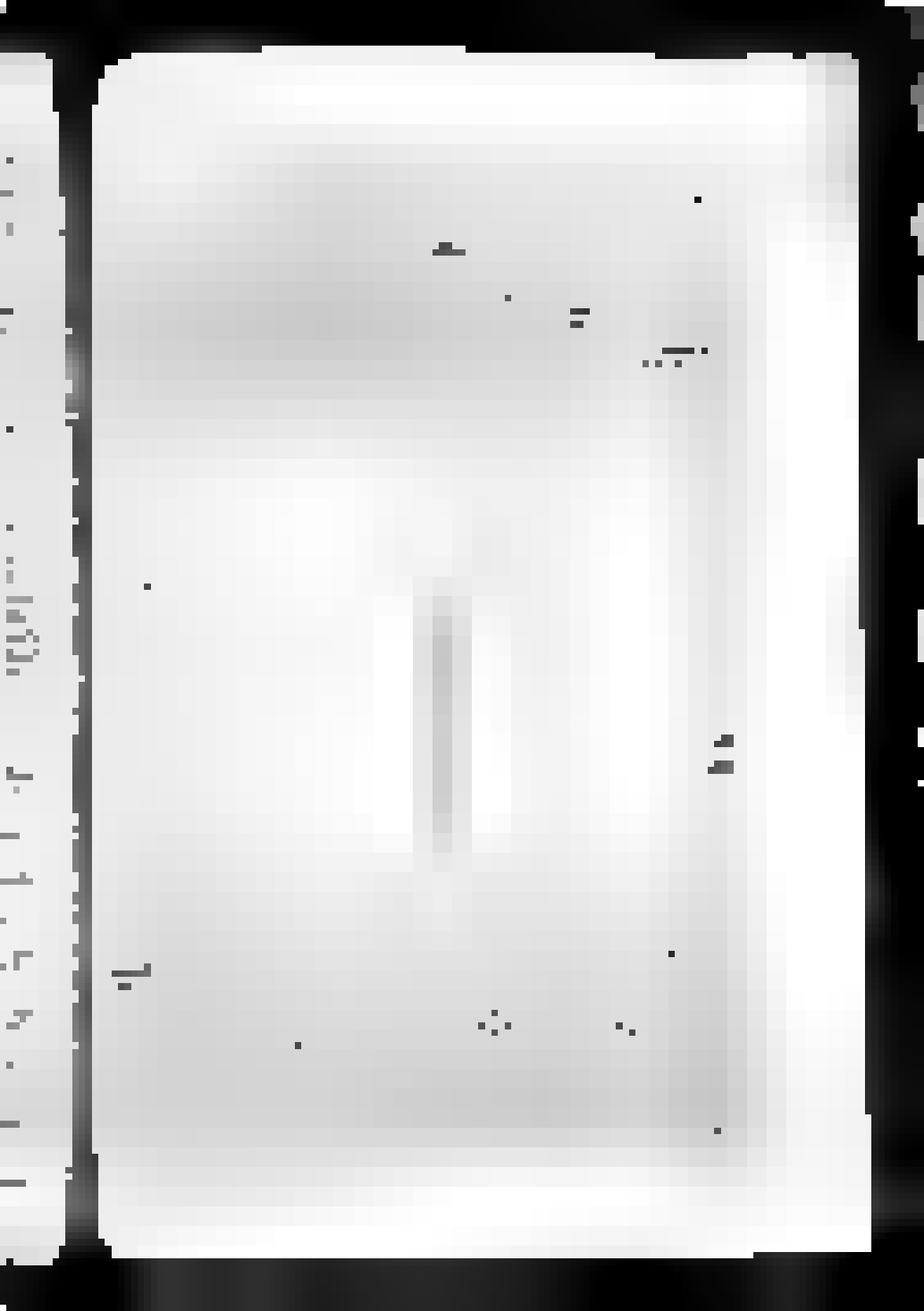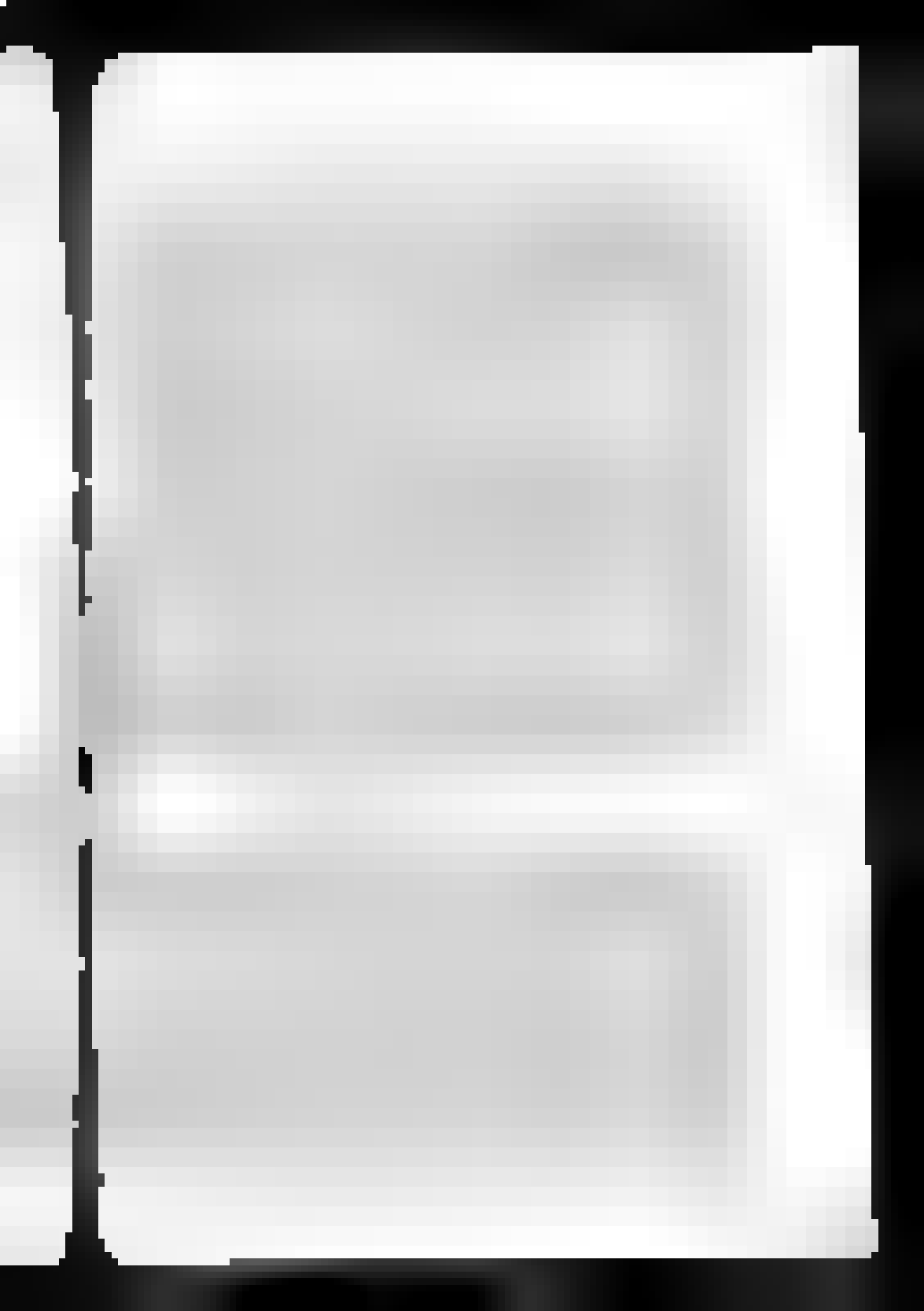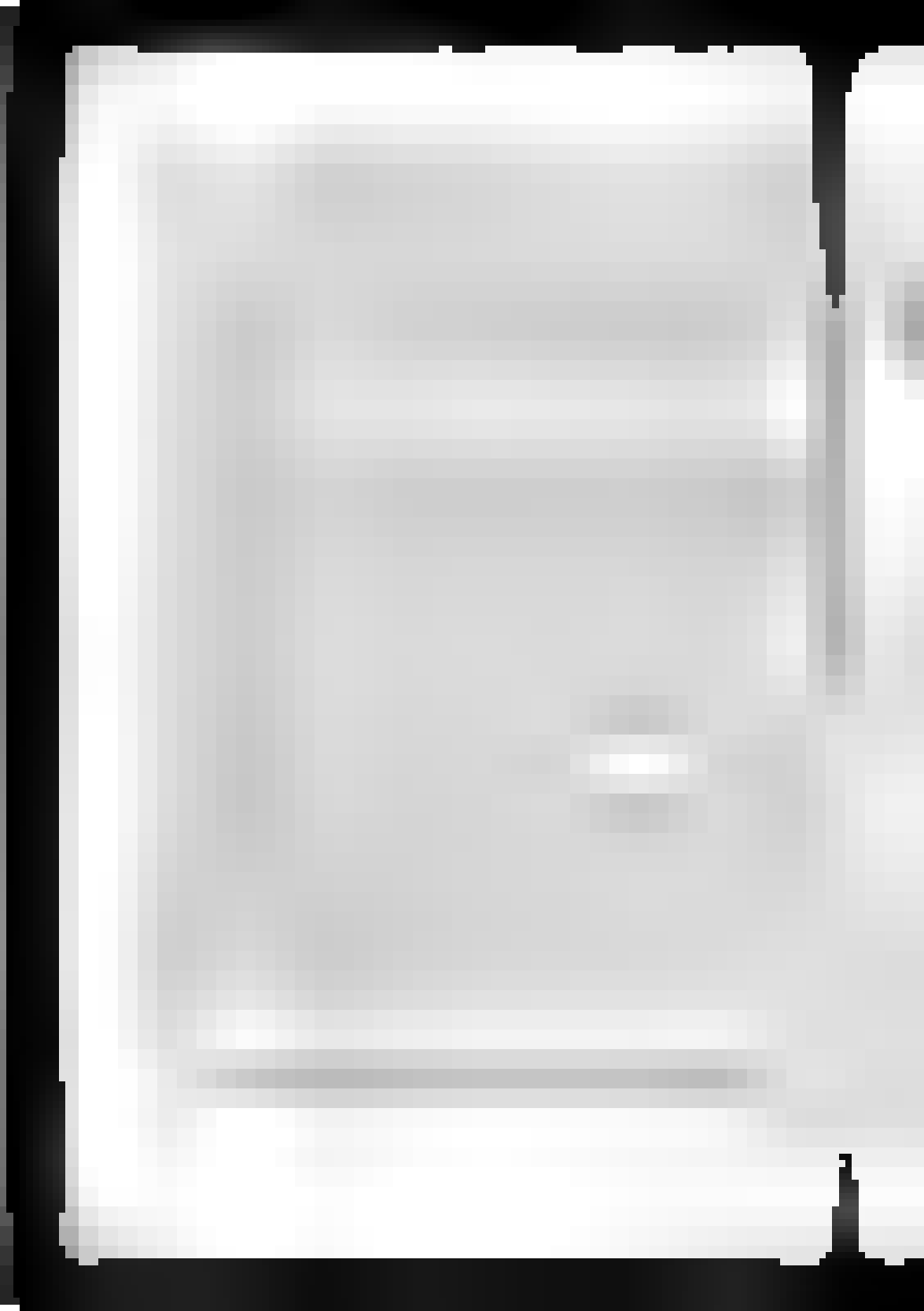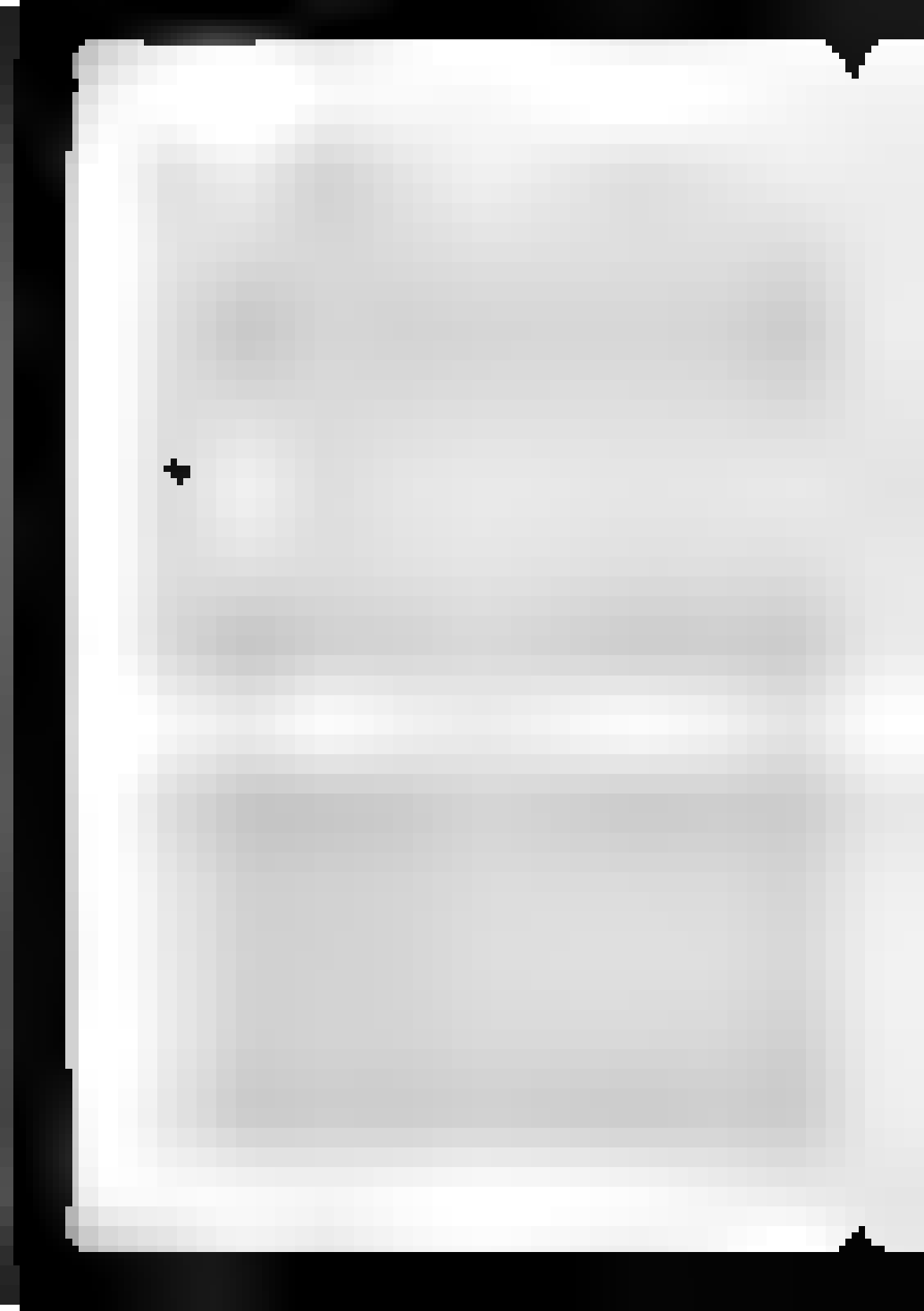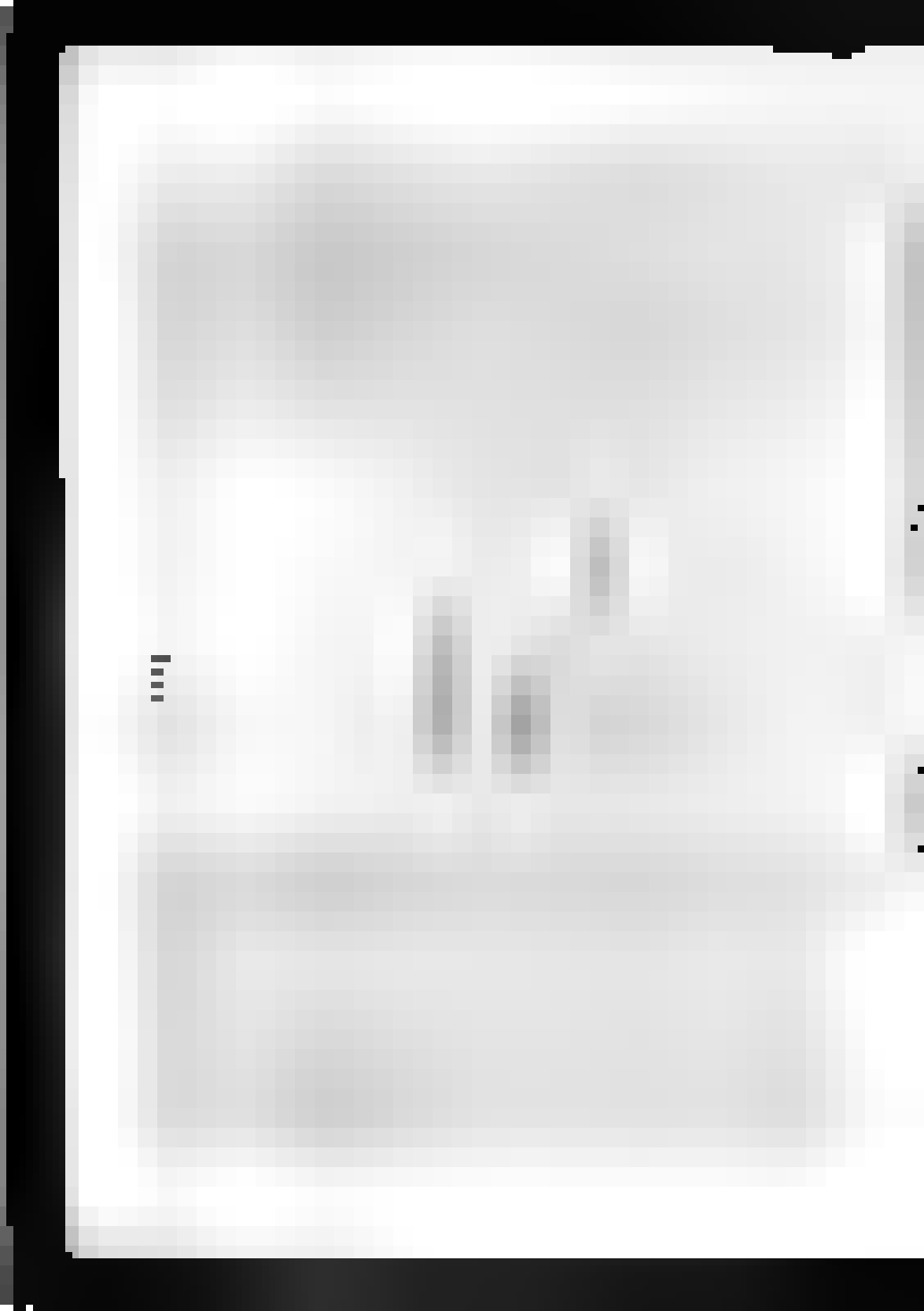
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